Snow-tastrophe

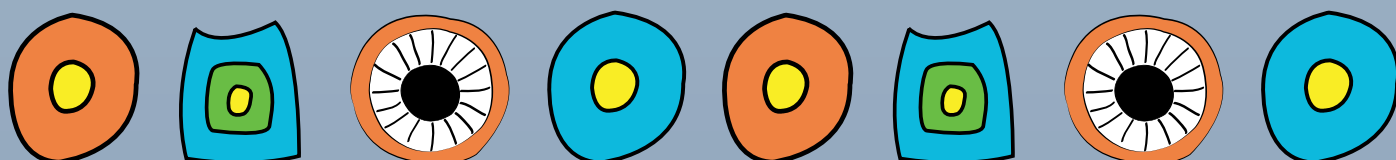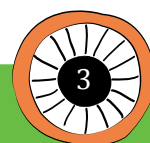## Volunteer Facilitator Guide

Table of Contents

Welcome to the **Volunteer Facilitator Guide** for this snowy robotics adventure! This curriculum is designed to be used with 4-H Cloverbud youth ages 5-7 years old. Being a 4-H volunteer means you will have an opportunity to help a young person develop his or her potential. Research indicates that if children are not introduced to STEM-related activities by the time they are in third grade, the likelihood of their pursuing STEM in the future declines significantly. By engaging youth early with experiential learning opportunities related to robotics, youth can develop the life skills necessary to be successful in a digital economy.

At first, becoming a robotics volunteer may seem overwhelming. It may seem that the youth are more knowledgeable about the technology and comfortable with the robot than you are; however, there are many areas in which you can contribute. You can provide a safe place for youth to engage in positive learning opportunities where they can develop a sense of belonging and purpose. By working with the youth in your club, you can place them on a path for future success. Another important purpose you have is to help youth learn how to persist in the face of difficulty. Learning to overcome obstacles -- such as fixing a robot that refuses to work, debugging a program, or working with teammates who have differing views -- are all important life skills. The primary focus should be on engaging Cloverbuds with meaningful fun where they can actively participate as an individual and within a team.

The **Snow-tastrophe** curriculum is designed around the Experiential Learning Model and the 4-H motto, "learn by doing." In the experiential model, the first step is to allow the youth to explore with little to no help from you. This can be quite difficult to do. However, 4-H and robotics are rooted in the constructivist learning theory. Constructivist learning theory says that children learn best when they are able to experience things firsthand and construct learning from their environment. Each of the lessons is broken down into the five steps shown in the model.

These lessons were created for a half-day (four-hour) camp format. However, they can be broken down to accommodate a one-hour class or a two-hour club meeting. A sample schedule is on the following page.

Image from University of Minnesota Extension 4-H (http://www.extension.umn.edu/source/winter-2013/4-h-prepares-youth-to-lead-and-succeed/). Adapted from D.A. Kolb, 1984.

Sample Camp Schedule:

DAY 1

8:00 am - 8:05 am	Welcome
8:05 am - 8:50 am	Unit 1/Building Block 1
8:50 am - 9:35 am	Unit 1/Building Block 2
9:35 am - 10:15 am	Unit 2/Building Block 1
10:15 am - 10:30 am	Snack
10:30 am - 10:45 am	Teamwork Activity
10:45 am - 11:30 am	Unit 2/Building Block 2
11:30 am - 11:55 am	Unit 3/Building Block 1
11:55 am - 12:05 pm	Clean-up/Charge Robots

DAY 2

8:00 am - 8:10 am	Welcome
8:10 am - 8:55 am	Unit 3/Building Block 2
8:55 am - 9:40 am	Unit 4/Building Block 1
9:40 am - 10:00 am	Make Ice Cream/Snack
10:00 am - 10:15 am	Teamwork Activity
10:15 am - 11:00 am	Unit 4/Building Block 2
11:00 am - 11:45 am	Unit 5/Building Block 1
11:45 am - 12:00 pm	Clean-up/Charge Robots

DAY 3

8:00 am - 8:10 am	Welcome
8:10 am - 8:55 am	Unit 5/Building Block 2
8:55 am - 9:40 am	Unit 6/Building Block 1
9:40 am - 10:00 am	Snack and Teamwork Activity
10:00 am - 10:55 am	Unit 6 Building Block 2
10:55 am - 11:30 am	Prepare presentations
11:30 am - 1:00 pm	Pizza parent luncheon

4-H Cloverbud – Ages and Stages

CHARACTERISTICS OF AGES 5 AND 6

Physical

- ▶ Energetic
- ▶ Learn to cut with scissors

Social

- ▶ Like to play with other children; are generally sociable
- ▶ Cooperate
- ▶ Usually obey rules
- ▶ Enjoy the process; end product not important

Emotional

- ▶ Desire affection and adult attention
- ▶ See situations from own point of view
- ▶ Learn self-control in groups
- ▶ Begin "selective hearing"

Intellectual

- ▶ Need clear and simple directions
- ▶ Have 10 to 15 minute attention span (if really interested)
- ▶ Learn best by exploring "real" materials

Implications/What You Can Do with Ages 5 and 6

- ▶ Help the children work together on 4-H Cloverbud activities.
- ▶ Plan activities with materials that are hands-on.
- ▶ Provide instructions both visually and verbally.
- ▶ Keep activities short in length.
- ▶ Engage the children in cooperative-learning activities.
- ▶ Plan activities that include large motor skills (jumping, running) and that introduce fine motor skills (writing, cutting, drawing).
- ▶ Encourage sharing and listening.
- ▶ Provide opportunities for adult-child interaction.
- ▶ Plan activities that are broken up by physical movement/exercise.
- ▶ Let the children know you care.

CHARACTERISTICS OF AGE 7

Physical

- ▶ Usually grow slowly and steadily
- ▶ Like repetitious activities, such as bouncing a ball or jumping rope

Social

- ▶ Want to join clubs
- ▶ Think about the future and other people

Emotional
- Sensitive to personal criticism and get upset easily
- Want to help with decisions
- Fear school failures and peer rejection
- Friends are important; family is still tops
- Begin to empathize with others' feelings

Intellectual
- Develop a sense of right and wrong
- Assert individuality
- Are very concerned about the rules
- Love to collect things

Implications/What You Can Do with Age 7
- Provide encouragement in noncompetitive settings.
- Give them simple responsibilities and the option of choosing their activities.
- Select activities that stimulate their curiosity and creative abilities.
- Explore future career possibilities.
- Promote active involvement in 4-H Cloverbuds.
- Be sensitive to their needs and promote social activities with other children.
- Provide physical activities to meet their skill levels.
- Give clear descriptions about how to be involved in 4-H Cloverbuds.
- Help the children to develop friendships.
- Encourage them to develop and make collections of things.

Guidelines for 4-H Cloverbud Programming

ACTIVITY BASED
- A variety of short-term experiences is required for this age group. Young children have short attention spans, especially if there are distractions around them.

COOPERATIVE-LEARNING CENTERED
- Activities and curriculum are done in small groups as opposed to doing projects or activities alone.
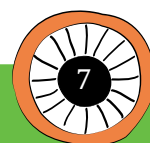
NON-COMPETITIVE
- Children are engaged in curriculum activities that are non-competitive without setting up categories or classes that create inequities.

SAFE
- Special consideration must be given to ensure the safety of Cloverbud aged children.

AGE APPROPRIATE
- The activity should be designed at their age level: 5 to 7 years old.

CLOVERBUD ACTIVITIES ARE DIFFERENT FROM ACTIVITIES FOR 8- TO 18-YEAR-OLDS

	4-H CLOVERBUDS	4-H MEMBERS 8 TO 18 YEARS OLD
Type of Learning	Activity Centered	Project Centered
Type of Instruction	Leader Directed	Self-Study, Individual or Leader Directed
Recognition	Participation	Competitions, Achievement of Standards, Achievement of Goals and Participation
Learn Resources	Activity Manuals	Project Manuals

SUCCESS ORIENTED

▶ Allow children to gain confidence and promote self-esteem by mastering 4-H Cloverbud activities.

▶ Any animal activity must meet the above parameters and 4-H Cloverbud objectives, such as promoting self-understanding (self-esteem) by mastering 4-H Cloverbud activities.

OPPORTUNITY AT THE 4-H VILLAGE AT THE STATE FAIR – EXHIBIT ONLY

▶ Children can exhibit work completed in their Cloverbud clubs or groups in the Clover Shop in the 4-H Village during the State Fair each year. Please refer to the 4-H Village Exhibit's list for specifics. You could also develop a 4-H Clover Shop at the county level!

▶ 4-H Cloverbuds may also create a robotic animal using either the LEGO WeDo or the Dash robot to showcase at the Robot Round-up during 4-H Day at the State Fair.

ACTIVITY IS FUN, POSITIVE AND FOCUSES ON THE FIVE GENERAL LIFE SKILL AREAS THROUGH THE EXPERIENTIAL LEARNING CYCLE

This is 4-H

4-H EMBLEM . . .
The 4-H Emblem is a green four-leaf clover with a white H on each leaf. The H's stand for HEAD, HEART, HANDS, and HEALTH

4-H PLEDGE . . .
"I pledge —
My HEAD to clearer thinking,
My HEART to greater loyalty,
My HANDS to larger service,
My HEALTH to better living,
for my club, my community, my country, and my world.

4-H MOTTO . . .
"To Make the Best Better"
Around the country, 4-H'ers have set their goals for 4-H club work by this motto:
"To Make the Best Better."

4-H SLOGAN . . .
"Learn By Doing"
The "Learn By Doing" slogan encourages 4-H members to learn new skills, be responsible for their actions, and express their own creativity.

4-H COLORS . . .
The white in the 4-H flag symbolizes purity and high ideals. The green, nature's most common color, represents life, springtime, and youth.

Standards

These lessons are based on the experiential learning model used by 4-H and is designed to be used in mixed age groups of children 5-7 years old. These learning modules are also aligned to the 4-H General Measures, although these measures are designed for youth aged 8-18. When appropriate, these measures are noted next to the activity to help agents and volunteers begin thinking about use of the 4-H measures in programming. Please use the tables below as a reference when using the individual lessons.

These are the *4-H General Common Measures*. They are referenced in the learning modules in the following manner: **C1a1 (Common/Outcome 1/Indicator a/Item 1)**:

OUTCOME	INDICATOR	ITEMS	NOTES:
1. Make positive choices	a. Youth will demonstrate responsibility, critical thinking and problem solving skills through informed decision making	1. I use information to make decisions 2. I am comfortable making my own decisions 3. I take responsibility for my actions	
2. Effectively Communicate	a. Youth will demonstrate the ability to communicate through multiple methods and media	1. I am comfortable sharing my thoughts and feelings with others 2. I can use technology to help me express my ideas 3. I listen well to others 4. I am respectful of others 5. I have the confidence to speak in front of groups 6. I know who I can go to if I need help with a problem	
3. Build Connections	a. Youth will develop positive and sustained relationships	1. I work well with other youth 2. I can work successfully with adults 3. I have friends who care about me	
4. Contribute	a. Citizens who contribute to their community and world	1. I am someone who wants to help others 2. I like to work with others to solve problems 3. I have talents that I can offer to others	

These are the following *4-H General Science Measures*. They are referenced in the learning modules in the following manner: **S1a1 (Science/Outcome 1/Indicator a/Item 1):**

OUTCOME	INDICATOR	ITEMS	NOTES:
1. Interest and Engagement in Science	a. Youth will express interest and be engage in science related activities	1. I like to see how things are made or invented 2. I like experimenting and testing ideas 3. I get excited about new discoveries 4. I want to learn more about science	
2. Positive Attitudes and Aspirations toward Science	a. Youth will express positive attitudes about science b. Youth will see science in their futures and recognize the relevance of science	1. I like science 2. I am good at science 3. I would like to have a job related to science 4. I do science activities that are not for school	
3. Develop Science Skills and Abilities	a. Youth will demonstrate a capacity for science process skills	1. I can do an experiment to answer a question 2. I can tell others how to do an experiment 3. I can explain why things happen in an experiment	
4. Apply learning, make a contribution through science	a. Youth will apply science skills to issues in their community	1. I taught others about science	

Snow-tastrophe Curriculum and the 4-H Common Measures and 4-H Science Measures

UNIT	BUILDING BLOCK	MEASURES
Unit 1: Building a Snowman	Building Block 1: Making Snow Building Block 2: Dash Builds a Snowman	S1a1, S1a2, S2a1, S1a3, S2a2, S3a1, S3a2, S3a3, C1a1, C3a1
Unit 2: Measuring Snow	Building Block 1: Dash Can Help Measure Snow Building Block 2: Dash to the Rescue	S1a1, S1a2, S3a2, S3a3, C2a5, C2a2, C2a3, C3a1, C3a3
Unit 3: Snowy Potion	Building Block 1: Making Snow Bubbles Building Block 2: Dash Captures the Snow Bubbles	S1a1, S1a2, S1a3, S3a3, C2a3, C2a5
Unit 4: Clearing the Roads	Building Block 1: Dash Clears the Road Building Block 2: Dash Removes the Stacks of Cars	S1a2, S3a1, S3a2, C2a2, C4a2
Unit 5: Offering a Helping Robot	Building Block 1: Dash Hears the Call Building Block 2: Dash Takes the Drivers' Temperature	S1a2, S1a3, S2a1, S3a1, S3a2, S3a3, S4a1, C3a1
Unit 6: Getting Back to Normal	Building Block 1: Dash Removes Tree Limbs Building Block 2: Dash Turns on the Train	S1a1, S1a3, S3a1, S3a3, C3a1
Parent Showcase		C2a1, C2a2, C2a5, S4a1
Supplemental Building Blocks	Supplemental Building Block 1 Supplemental Building Block 2	C2a2, C3a1, S1a2 C2a2, C3a1, S1a2

Snow-tastrophe Curriculum and the 2010 Mississippi Science Framework

http://www.mde.k12.ms.us/docs/curriculum-and-instructions-library/inquiry-strand.pdf?sfvrsn=4

UNIT	BUILDING BLOCK	FRAMEWORK
Unit 1: Building a Snowman	Building Block 1: Making Snow Building Block 2: Dash Builds a Snowman	Strand: Inquiry Kindergarten: 1a/DOK2, 1f/DOK1 First Grade: 1a/DOK2, 1f/DOK2 Second Grade: 1a/DOK2, 1f/DOK2
Unit 2: Measuring Snow	Building Block 1: Dash Can Help Measure Snow Building Block 2: Dash to the Rescue	Strand: Inquiry Kindergarten: 1e/DOK2, 1c/DOK1 First Grade: 1e/DOK2, 1c/DOK1 Second Grade: 1c/DOK1, 1f/DOK2
Unit 3: Snowy Potion	Building Block 1: Making Snow Bubbles Building Block 2: Dash Captures the Snow Bubbles	Strand: Inquiry Kindergarten: 1a/DOK2, 1e/DOK2 First Grade: 1a/DOK2, 1e/DOK2 Second Grade: 1a/DOK2
Unit 4: Clearing the Roads	Building Block 1: Dash Clears the Road Building Block 2: Dash Removes the Stacks of Cars	Strand: Inquiry Kindergarten: 1c/DOK1, 1b/DOK2 First Grade: 1c/DOK1, 1b/DOK2 Second Grade: 1c/DOK1, 1b/DOK2
Unit 5: Offering a Helping Robot	Building Block 1: Dash Hears the Call Building Block 2: Dash Takes the Drivers' Temperature	Strand: Inquiry Kindergarten: 1a/DOK2, 1c/DOK1 First Grade: 1a/DOK2, 1c/DOK1 Second Grade: 1a/DOK2, 1c/DOK1
Unit 6: Getting Back to Normal	Building Block 1: Dash Removes Tree Limbs Building Block 2: Dash Turns on the Train	Strand: Inquiry Kindergarten: 1a/DOK2, 1f/DOK1 First Grade: 1a/DOK2, 1f/DOK1 Second Grade: 1a/DOK2, 1f/DOK1
Parent Showcase		
Supplemental Building Blocks	Supplemental Building Block 1	Strand: Inquiry Kindergarten: 1a/DOK2 First Grade: 1a/DOK2 Second Grade: 1a/DOK2
	Supplemental Building Block 2	Strand: Inquiry Kindergarten: 1a/DOK2 First Grade: 1a/DOK2 Second Grade: 1a/DOK2

Snow-tastrophe Curriculum and the Next Generation Science Standards for K-2 Engineering Design

http://www.nextgenscience.org/k-2ets-engineering-design

When appropriate, these lessons have also been aligned to the Next Generation Science Standards for those teachers who wish to use these lessons in their classroom.

UNIT	BUILDING BLOCK	STANDARDS
Unit 1: Building a Snowman	Building Block 1: Making Snow Building Block 2: Dash Builds a Snowman	K-2-ETS1-1/ELA R1.2.1
Unit 2: Measuring Snow	Building Block 1: Dash Can Help Measure Snow Building Block 2: Dash to the Rescue	K-2-ETS-2
Unit 3: Snowy Potion	Building Block 1: Making Snow Bubbles Building Block 2: Dash Captures the Snow Bubbles	K-2-ETS1-1/ K-2-ETS-2 2-PS1-3
Unit 4: Clearing the Roads	Building Block 1: Dash Clears the Road Building Block 2: Dash Removes the Stacks of Cars	K-2-ETS1-1/ K-2-ETS-2 K-PS2-1 K-ESS3-3 2-PS1-1 2-PS1-3
Unit 5: Offering a Helping Robot	Building Block 1: Dash Hears the Call Building Block 2: Dash Takes the Drivers' Temperature	K-2-ETS1-1/ K-2-ETS-2 1-PS4-4 2-PS1-3 2-PS1-4
Unit 6: Getting Back to Normal	Building Block 1: Dash Removes Tree Limbs Building Block 2: Dash Turns on the Train	K-2-ETS1-1/ K-2-ETS-2
Parent Showcase		
Supplemental Building Blocks	Supplemental Building Block 1 Supplemental Building Block 2	K-2-ETS1-1 K-2-ETS1-1

SNOW-TASTROPHE UNIT 1: BUILDING A SNOWMAN

Goals:

▶ To demonstrate a physical reaction for 4-H Cloverbuds

▶ To enable 4-H Cloverbuds to measure dry and liquid substances accurately to create the physical reaction

▶ To use models so that 4-H Cloverbuds can identify and build shapes

▶ To facilitate the 4-H Cloverbuds' use of the Path app to manipulate the Dash robot

Objectives:

4-H Cloverbuds will be able to

▶ Measure unknown quantities to produce a physical reaction (the "snow" does not change).

▶ Demonstrate critical thinking skills by solving problems.

▶ Describe in age-appropriate language what a hypothesis, polymer, and app are.

▶ Use the Path app to navigate the robot in circles.

Preparation:

▶ Install the Path for Dash robot app from the Google Play or iTunes store.

▶ Measure ¼ cup of prepared Insta-Snow for each team of youth and leave it at their station with a magnifying glass prior to their arrival.

Materials:

❏ Insta-Snow (purchased from Steve Spangler [Item # WSNO-500; $9.99] or homemade)

❏ A set of measuring spoons, a measuring cup, and a container for each pair of youth

❏ One large sheet of paper (poster board size or larger) for each pair of youth

❏ 1-2 markers for each pair

❏ 1-2 rubber bands for each pair

❏ 1 magnifying glass per pair

❏ 1 pre-filled water balloon for each pair

❏ 1 diaper for each pair

❏ 1 diaper cut open to reveal the inside

❏ 1 large disposable metal roasting pan for each pair of youth

❏ Safety goggles for each youth

❏ Pencil for each youth

Getting Started

Greet youth and their parents/guardians as they arrive. Be sure each youth has a nametag. Direct them to their stations. Each youth should have a partner. If possible, use the Path app for Dash to guide each youth to their seat. Once at their seat, youth may use the magnifying glasses to examine the "snow" at their work-stations. Be careful not to tell them what the snow substance is in the clear containers. Let them explore it on their own while you wait for everyone to arrive.
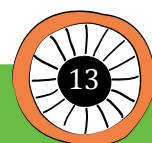
DAY 1

Welcome (5 minutes)

Welcome to our 4-H Robotics Club meeting! Let's begin by saying the 4-H pledge:

I pledge
My Head to clearer thinking,
My Heart to greater loyalty,
My Hands to larger service, and
My Health to better living,
For My Club, My Community,
My Country, and My World.

During our time together we are going to do many exciting things, so it is very important that you listen closely at all times. There are several things I want you to remember:

▶ Be kind to your fellow 4-H'ers; treat everyone with respect.

▶ If you need help, please raise your hand to ask, and one of the assistants or I or will help you.

▶ Be very kind to the robots; we do not want them to get hurt.

▶ Always treat your tablet like it is an extension of your arm -- don't leave it somewhere by itself!

▶ Remember to share. You are all very smart and can help each other learn a lot. Can we all work together to have fun and learn a lot this week?

Unit 1/Building Block 1: (45 minutes)   Making Snow

Read PowerPoint slides 3-6 of the story "Snow-tastrophe".

Discuss

▶ Is it possible to really make snow?

▶ How would you make snow?

Experience

▶ On the table in front of you are several different materials. Can you tell me what they are?
Measuring spoons, measuring cup, water, polymers, clear cups, goggles

▶ Look at the worksheet "Working in My Lab." Do you see any of the items at your station on your worksheet? Circle each item that you see at your workstation.

On a grey and cloudy day, Camila Mae looked out in dismay.
The weekend had come and gone, but she still had tasks to work upon.
Her homemade lab was all a buzz! You see, Camila Mae was ordinary by day,
But at home, inventing was her way to play.

▶ Now that you know what supplies you have to work with, think about what you would need to mix together to make snow. When we make an educated guess about how something will work, that educated guess is a hypothesis. An example hypothesis might be something like this: If I add 1 tablespoon of powder and 1 tablespoon of water, then snow will be created. Can someone give me another example of a hypothesis? What would you have to do to recreate Vinnie the Cat's big mess?

*Note: Most of the 5-year-olds will need an older youth or volunteer to help write down their answers.

Share

▸ Talk with your partner and decide how much of each material you need to mix together to make snow. Use your worksheet to record your hypothesis. What is a hypothesis?

▸ Put your safety goggles on and begin to test your hypothesis.

Allow youth to experiment with the water and polymers. Observe which pairs are closest to getting the correct combination. Ask those pairs to report their findings to the rest of the group.

Give groups that need more time an opportunity to adjust their combinations so that they can make snow.

▸ Now that everyone has a nice pile of snow, what does it feel like? Is it cold? How many sides does each flake have?

Process

▸ Look back at your worksheet. Which hypothesis worked best?

▸ Do you think it is important to write down your results? Why or why not?

When we record our results, it helps us to remember what worked and what did not work.

Generalize

▸ Did you know that real snowflakes always have 6 sides? How many sides does your snowflake have? Use your magnifying glass to look closely.

There will not be 6 sides to the "snow," so this is good time to explain that the "snow" is really made up of polymers.

When Camila Mae had time to think,
she went to her lab to create a stink.
On this particular afternoon, she was working on a robot to send to the moon.
If only she didn't have to go back to school so soon!
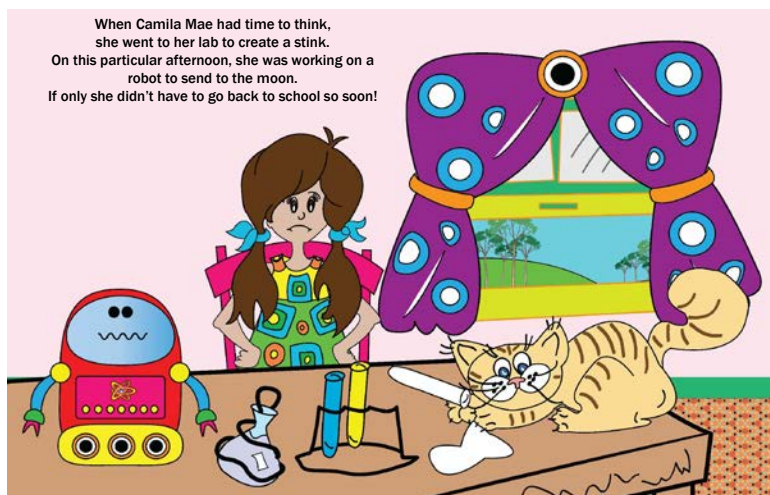
As she sat at her table working away,
she didn't see her cat Vinnie had come to play.
Vinnie rubbed against the beakers and gave her homework a bat.
Then he landed on the test tubes with a big KER-SPLAT!

C – R – A – S – H !
Went the test tubes as they spilled to the ground.
Vinnie the cat did not stick around!
Camila Mae watched the puddle begin to bubble.
Vinnie the cat was in big trouble!

Looking closely, she saw little white flakes growing on her floor.
One flake, two flakes, four flakes, more! Before she knew it, they were out the door.
"What could this white fluff be? She wondered aloud.
Each flake had six sides, and the pile kept growing. She thought to herself, "It must be snowing!"

▶ What is a polymer? A polymer is made of lots of molecules that are connected together to make something you can touch.
- Have one child stand up. Explain that this child represents an atom. Atoms are very tiny and you cannot see them with your eyes. If we put two atoms together, it is called a molecule. Have another child stand up beside the first child. Now we have two atoms. If they join together, they become a molecule. Have the children stand back to back and interlock elbows. Now that our two atoms are joined together, we have molecule. Molecules can do more than atoms because they work together.
- Have two more sets of 4-H Cloverbuds come up. They should interlock arms with the other two children and with each other to form a square, still standing back to back. Explain that a polymer is when many molecules join together to form something.
- Polymers are all around us. They make up everything we touch. Can you spot a polymer in the room?

Apply

▶ Give each group a baby diaper. Hold up the diaper and ask the 4-H Cloverbuds to identify it. What do we use it for?

▶ Baby diapers help babies stay dry! Open up the diaper. Do you see any polymers in there? Show the Cloverbuds the diaper you cut open so they can see the inside of it. The diaper has polymers in it too! It absorbs water just like your snow polymers absorbed water. Hold up a water balloon. Do you think that your diaper can absorb all of the water from the water balloon? We are going to find out if your diaper works! I am going to give each group a water balloon. Leave the water balloon in the pan. Put the diaper on the water balloon and secure it with the tabs on the diaper. Demonstrate this for the children. Be sure to leave your water balloon baby in the pan!

▶ Take children outside or to a large open area. Have Cloverbuds carry their pans containing their balloons with them.

▶ Have Cloverbuds form "molecules" in partners by standing back to back and linking elbows. Place the water balloon baby between the backs of the two youth. As a molecule, you and your partner must get your water balloon baby from the starting line to the goal point and back again. (Your goal point could be a cone, tree, sidewalk, etc.) Good molecules work together to make something. If you drop your water balloon baby, you must start over again. I am going to give you one minute to discuss your strategy with your other atom."

▶ Have the molecule teams line up. When I say GO, you may start. 3, 2, 1, GO!

▶ Once everyone has made it back to start line, ask youth if it was hard to keep the water balloon from falling. If a water balloon did fall, what happened?

▶ Remind the youth that when many molecules join together, they form a polymer. Tell the youth they will form a polymer. Each molecule partnership should join with another molecule partnership to form a group of four. This group will link elbows to become a polymer. Now place the water balloon baby in each polymer group. As a polymer, your group must get your water balloon baby from the starting line to the goal point and back again. Your goal point could be a cone, tree, sidewalk, etc. Polymers work together and are stronger and can do more. If you drop your water balloon baby, you must start over again.

▶ Have the polymer team line up. When I say GO, you may start. 3, 2, 1, GO!

▶ Once everyone has made it back to start line, ask youth if it was hard to keep the water balloon from falling. If a water balloon did fall, what happened?

▶ What is the difference between a molecule and a polymer?

▶ Now, have youth place the water balloon in the pan. Help each group puncture their water balloon and see if the diaper absorbs the water. Ask youth to share what they think happened.

Read PowerPoint slide 7 of the story, "Snow-tastrophe".

Discuss

▶ In our story, Reed got covered in snow -- so much snow that he looked like a snowman. What do snowmen look like?

Experience

▶ I want each pair to find a large sheet of paper on the floor to work on.

▶ Working with your partner, draw a large snowman. Snowmen are fun to build. Let's see if we can get our robot to help build the snowman. Leave the groups in pairs if there are enough tablets and robots or place them in groups of four for the next activity.

▶ Open the Path app on your tablet. See if you can get Dash to follow the path of your snowman. Use the Dash Builds a Snowman programming guide if you need help.
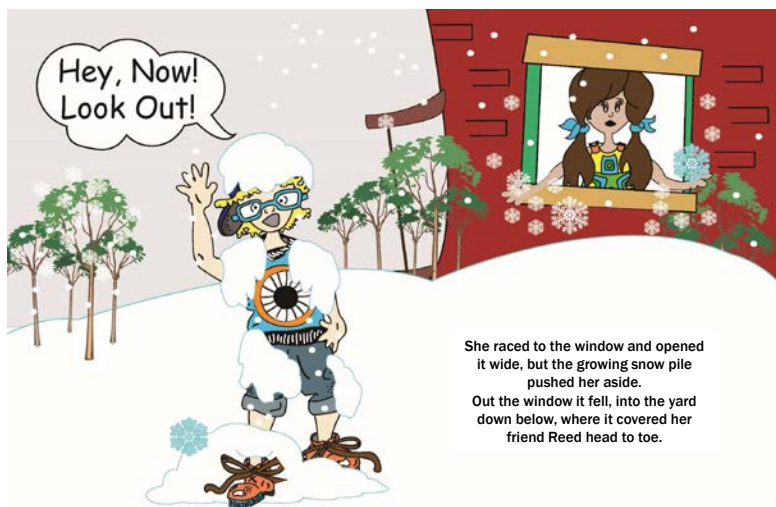
She raced to the window and opened it wide, but the growing snow pile pushed her aside.
Out the window it fell, into the yard down below, where it covered her friend Reed head to toe.

Reed looked like a snowman with his arms poking out.
He looked at Camila and said with a shout, "Hey, now! Look out!"
As Reed shook the snow off, Camila Mae ran out to see. The snow was still growing rapidly!

Dash Builds a Snowman Programming Guide

1. Tap Path App to Open
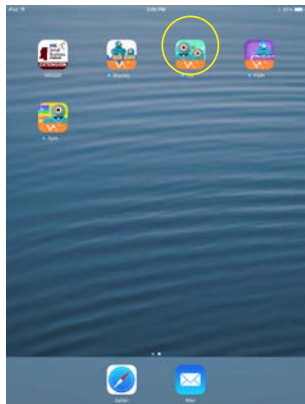
Find the Path app on your tablet. Tap Path to open the app.

Remember, you can download the Path app from the app store for free but your tablet must have Bluetooth 4.0 for the app to talk to Dash.

2. Tap OK
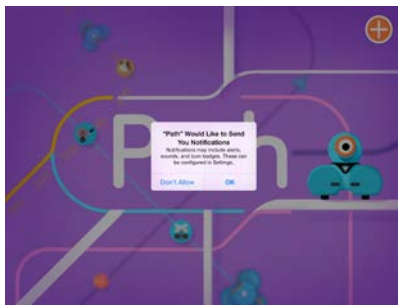
3. Tap Orange Circle

If you see a screen that asks to push notifications, press OK. Next, tap the orange plus sign in the upper right hand corner. This button will help the tablet find Dash.
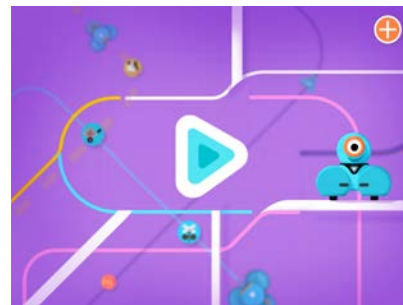
4. Find Dash

Follow the next three steps to connect Dash to the tablet.
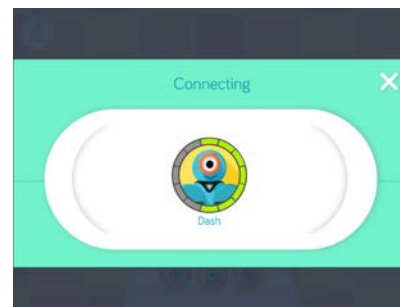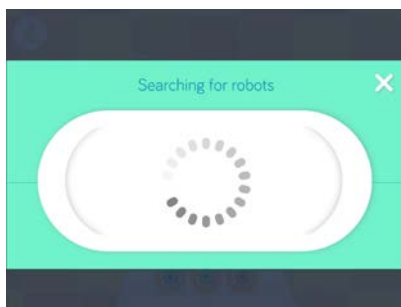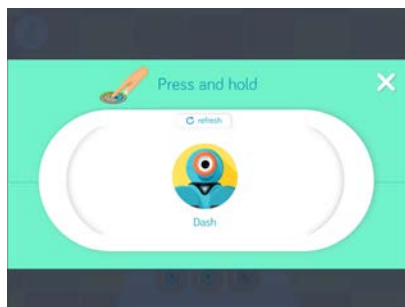
5. Open the Program
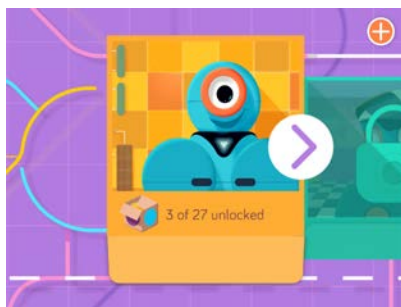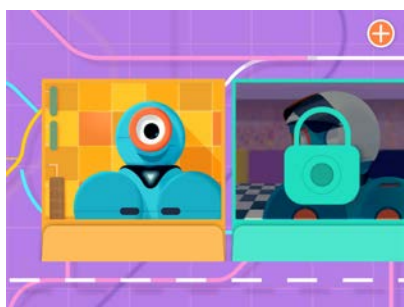
Notice that the orange circle with a plus sign in it is now Dash! Tap the orange block with Dash in it to begin drawing your snowman.

6. Draw Your Snowman
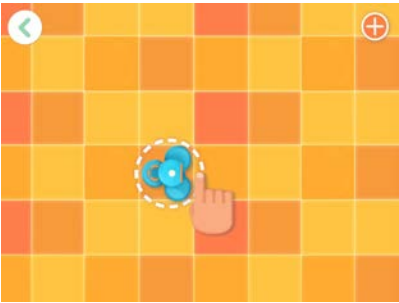
Use your finger to draw a path for Dash.

How does Dash know when to start? You have two options:

1. Press the Dash icon on the screen. – OR-
2. Press the button on top of Dash's head.

If you press the red X circle, this will erase the path.
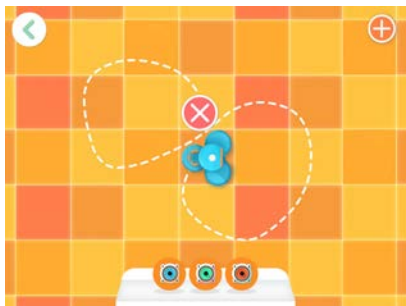
The three circles at the bottom (blue, green, red) are called nodes. If they are drug onto the path, Dash will change the colors of his ears.

7. Remove Obstacles

Dash displays this message on the tablet each time the sensor discovers something in Dash's path. Dash will stop and back up or turn around and continue until the program is executed.

Were you able to make Dash complete all of the snowman at the same time?   YES   NO

Draw the path that worked best for you here:

How could you make Dash actually draw a snowman?

_____

_____

_____

_____

_____

_____

_____

_____

Share

▶ What happened when you first tried to make Dash move?

▶ How did you get your tablet to talk or connect with Dash?

▶ What happened once Dash realized your tablet was talking to him/her?

▶ What did you like the most?

Process

▶ How does the robot know what to do?

▶ Was there a time when Dash did not do what you wanted him/her to do? What did you do?

Generalize

▶ Sometimes when the weather is not good outside (like when there is a lot of snow), it is not safe for people to go outside. Can you think of a way to use a robot in the snow?

Apply

▶ Let's watch how one robot eats snow: https://www.youtube.com/watch?v=gl2j9PY4jGY

References:
https://www.ccmr.cornell.edu/sites/default/files/Snow%20Polymer%20Unit.pdf

SNOW-TASTROPHE UNIT # 2: MEASURING SNOW

Goals

▸ To use standard and nonstandard units of measurement

▸ Gain greater fluency in manipulating Dash using the Path app

▸ Express interest in seeing how things are made or invented

Objectives

4-H Cloverbuds will be able to

▸ Identify the parts of Dash.

▸ Create a working mechanism for Dash to move snow.

▸ Use a nonstandard unit of measurement to measure the amount of snow created.

▸ Discuss what an engineer does.

Prepare

▸ Photocopy the color by number Parts of Dash worksheet for each Cloverbud.

▸ Photocopy the Dash Measures the Snow worksheet for each group.

▸ Photocopy the Measuring Snowmen activity sheet for each group on page 26.

▸ Have the building bricks connectors and bulldozer bar accessories available for each group.

▸ Have LEGO® building blocks available for construction.

Materials:

❏ One color by number Parts of Dash worksheet for each Cloverbud.

❏ One Dash Measures the Snow worksheet for each group.

❏ One Measuring Snowmen activity sheet for each group.

❏ Dash building bricks connectors and bulldozer bar accessories for each group

❏ LEGO® building blocks

❏ Crayons for each group

❏ Pencil for each child

❏ One LED light per child/group

❏ One CR2032 battery per child/group (The cheapest battery option is to purchase battery operated tea lights from a dollar store and take the battery out.)

Read slides 8-10 of the Snow-tastrophy story.

Discuss

▶ Dash is a very fun robot and can do many things. You can do lots of things, too. What body parts help you move and work?

▶ Just like you have arms and legs and eyes, Dash has many different parts that make him work. Let's see if we can figure out what makes Dash move.

Experience

▶ Call the Cloverbuds' attention to the Parts of Dash worksheet.

▶ Point to the power switch on Dash. What does this button do? On your worksheet, the power button is labeled with a 1. What color should we make the power button? On the activity sheet, 1 = green

▶ Point to the USB charger port on Dash. What does this port do? On your worksheet, the port is labeled 2. What color should we color the port? On the activity sheet, 2 = orange

▶ Point to Dash's ears. What do Dash's ears do? Dash's ears have LED lights in them so they can light up. Later on, we will learn how to change the color of Dash's ears. Wouldn't it be weird if you could change the color of your ears? What color should we make Dash's ears? On the activity sheet, 3 = purple

▶ Point to Dash's chest. What does this triangle on Dash's chest? It is also an LED light that can change colors. Maybe Dash uses it for a flashlight! What color should we make Dash's flashlight? On the activity sheet 4 = yellow

▶ Point to Dash's taillights. What do these lights do? These are also LED lights, and they are Dash's taillights. What color should we make Dash's tail lights? On the activity sheet 5 = red

Camila Mae and Reed stomped back inside to figure out what to do about the snow outside. Marshmallows and cocoa warmed their hands as they held their cups... But then they noticed the television truck had shown up!

Reporting live from WCBI

They peeked out the window and what did they see, but a reporter they knew from local TV! She said, "Reporting live from WCBI! The Governor's concerned about this snow in July! He's declared a State of Emergency. Many homes are without electricity. The trains have stopped running. No supplies are coming. Traffic is stopped, and none can go out. It is a disaster, and there's no doubt!"

Camila Mae and Reed slipped upstairs to discuss this distressing state of affairs. "What should we do?" said Camila Mae. "The snow's gotten higher and it's in the way! We must make it stop snowing. We must do it today!"

Then an idea came to Camila Mae: "We can use Dash the robot to save the day." "Cool idea," said Reed as he picked up his tablet. "We will sound the alarm and call all our friends. If we all work together, this nightmare will end!"

- ▶ There are two sensors on the front of Dash and one on the back that sense distance. These help Dash detect obstacles in his way. What color should we make Dash's sensors? On the activity sheet, 6 = black

- ▶ Look at the top of Dash's head. There are four circles. The big circle is known as the top button. We will use it when we program Dash. What color should we color the top button? On the activity sheet 7 = yellow

- ▶ There are three other buttons on the top of Dash's head. What do you notice about them? One button has one dot, the next button has two dots, and the third button has three dots. What do you think they do? They help Dash execute the program you write for him. We will use these buttons later on when we program. What color should these program buttons be? On the activity sheet, 8 = orange

- ▶ Dash has several orange circles on his sides. What do you think they do? They are used to attach things to Dash. Try and attach the building brick connector or bulldozer bar to Dash. We can make Dash do really cool things by using his "arms" to add things we build to him. What color should we make Dash's "arms"? On the activity sheet, 8 = orange

- ▶ Dash also has three microphones so that he can hear you. Where do you think these microphones are? What color should we make the microphones? On the activity sheet, 9 = orange

- ▶ If you look at the bottom of Dash, he has three wheels. What do you notice about the wheels? That's right! One moves in a full circle (360 degrees) while the other two only move forwards and backwards. What color should make the wheels? On the activity sheet, 10 = black

- ▶ Dash's eye has an infrared sensor in it so that Dash can see his friend Dot. Can you find the eye? What color should we make it? On the activity sheet, 11 = black

- ▶ All around Dash's eye are LED lights. They can change colors. Can you point out the LED lights around Dash's eye? What color should we make the LED lights? On the activity sheet, 12 = pink

- ▶ Now you know all of the different parts of Dash. Finish coloring your robot. On the activity sheet, 13 = blue

Share

- ▶ If we needed Dash to move snow, how would we do it?

- ▶ Work with your group members to design an arm for Dash to move the snow. Draw your design on the Dash Measures Snow activity sheet.

- ▶ Ask youth to share their designs with other groups or the entire club.

Process

- ▶ Using the design you drew in your workbook, use the building brick connectors, LEGO building blocks, or materials from the accessory pack to create an arm for Dash.

- ▶ Did your design work? What did you have to change?

Generalize

▶ Now that you have a working arm for your robot, I want you to pour all of your snow out onto the table in a straight line.

▶ I'm going to give you a picture of a snowman. I want you to use the Go app to push all of the snow onto the snowman. Fill up as many of the circles as you can with snow. You may not use your hands to push the snow. Only Dash can touch the snow. Refer to the programming sheet Dash Measures Snow guide if you need help.

▶ Allow youth time to work with Dash to position the snow for this unusual unit of measurement. Youth may need to tweak or redesign their arm.

▶ How did the arm you designed work? Did you have to go back and change anything?

▶ Look at your Measuring Snowmen activity sheet. The snowman on your activity sheet looks exactly like the one Dash just helped you make. Look at how much snow Dash piled up. Did Dash cover one circle? A ½ circle? On your activity sheet, record the area Dash covered in snow by coloring in the places Dash put snow. How much of your snowman was covered in snow?

▶ Now take all of your snow and put it in the measuring cup. How many cups of snow did you make?

Apply

▶ When we identify a problem, brainstorm what we can do to fix the problem, build something to fix the problem and then test out what we did – that is the engineering design process. Once we test out our idea, we can redesign it and make it better.

▶ What was our problem? Dash needed an arm to move the snow

▶ What did you brainstorm? We thought about how to design an arm for Dash

▶ What did you build? an arm for Dash

▶ What happened when you tested it? Various answers

▶ Did you have to go back and redesign it? What happened when you tested it again?

▶ Congratulations on being an engineer! An engineer is someone who designs and builds things.

▶ Let's watch this video to see what other engineers do: http://engineeryourlife.org/cms/6196.aspx?ey-lprofile=Video

▶ What kind of engineer would you be? What would you design and build?

Measuring Snow Programming Guide

1. Tap the Go App to Open
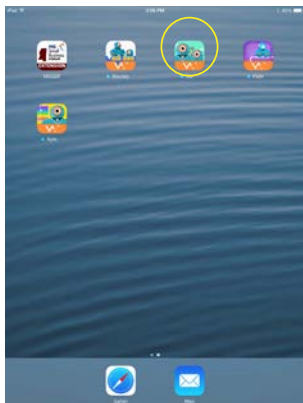
2. Be sure Dash is connected to the tablet.
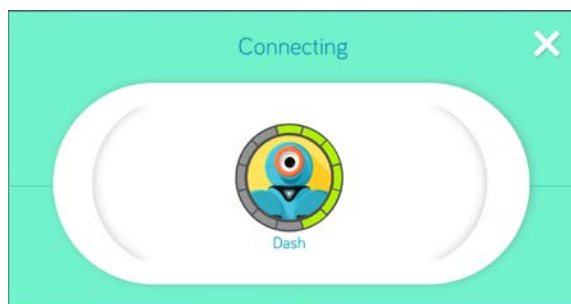
3. Drag your finger around the steering wheel to move Dash.

Be sure the compass tab is selected.
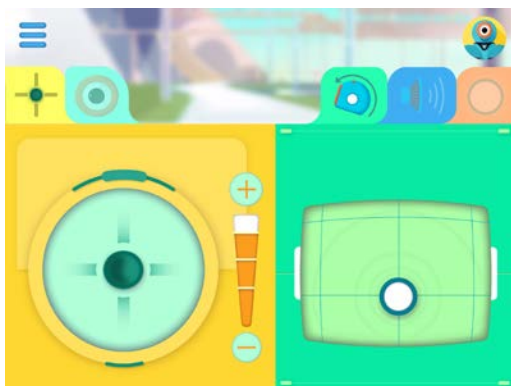
Use your finger to 'steer' Dash with the wheel.

4. Use the Yes/No rectangle (pan & tilt) to move Dash's head.
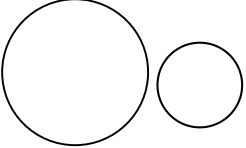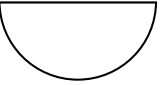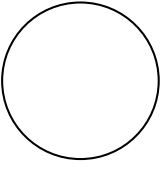
Use your finger to move Dash's head back and forth or up and down.

Measuring Snowmen Activity Sheet

Use the Path app on Dash to move the snow
onto your snowman.
Circle how much snow Dash measured.

Dash measured:

1 large snowball **1 medium snowball**	
¼ snowball	
½ snowball	
1 large snowball	
1 small snowball	

1/2

1/4   1/4
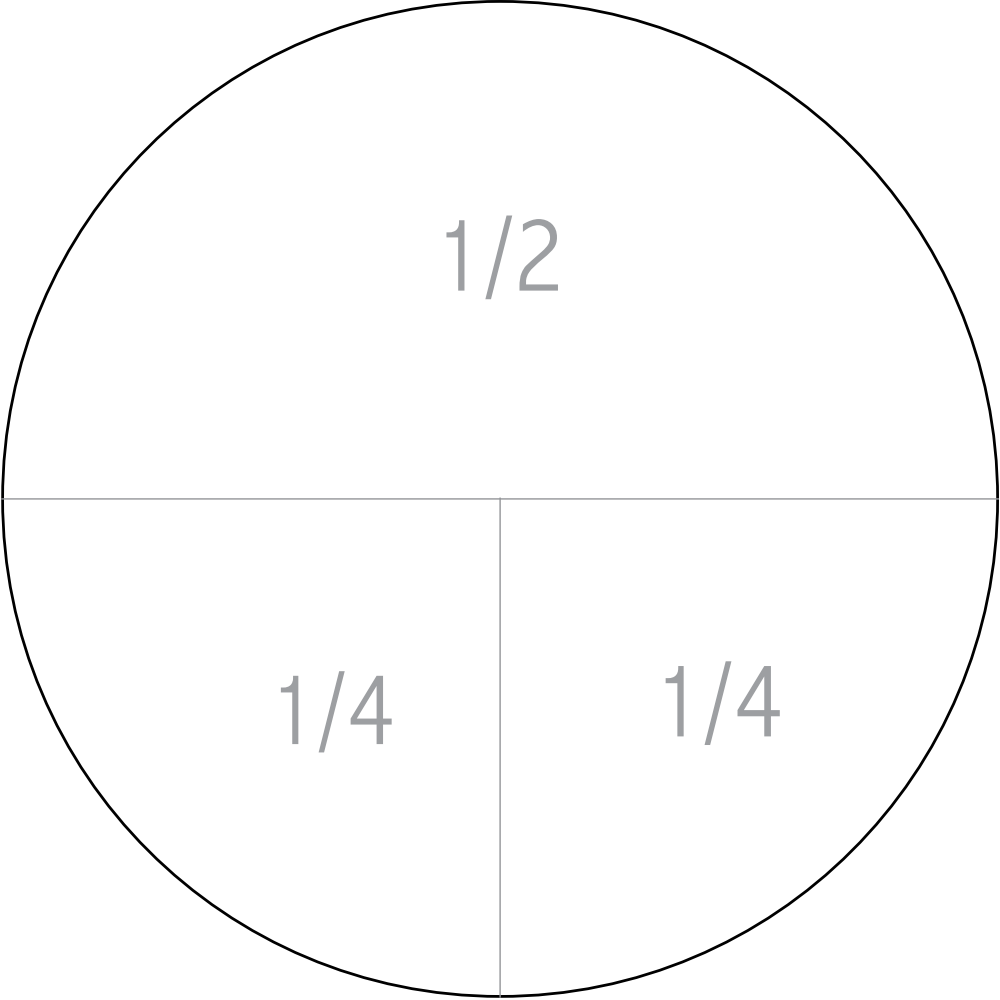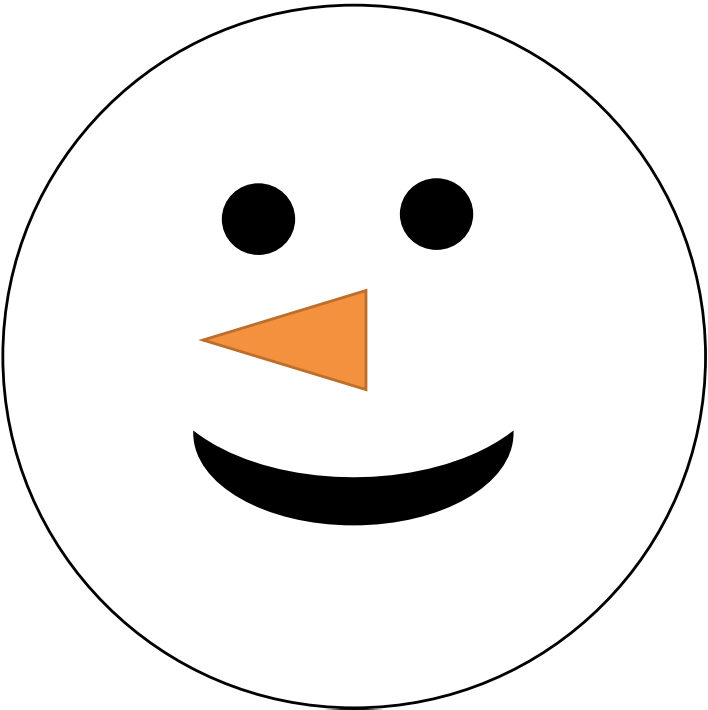
Snack Time: (15 minutes)

Materials:
- ❏ String cheese
- ❏ Black and orange permanent markers
- ❏ Grapes
- ❏ Hot chocolate/chocolate milk or water

Remember, 4-H Cloverbuds need to recharge their batteries after a morning of hard work. Providing healthy snacks and physical activity will help them prepare for the second day of camp. Ask a volunteer, parent, or senior 4-H'er to prepare the snowman string cheese beforehand. This is a good time to recap what has happened in the story so far and remind youth that if one grape were a molecule, a bunch of grapes together would be a polymer.

Activity/ Teamwork Time: (15 minutes)

Materials:
- ❏ one can of shaving cream for each team of four to five youth
- ❏ one picture of a snowflake for each team of four to five youth

▶ Break youth up into teams of four or five youth. Have youth elect one person from each group to be Dash. Ask "Dash" to stand 5 feet away from the rest of the team. Tell the rest of the youth that they are going to be the programmers. Explain that a programmer is someone who gives instructions to a computer or robot to do a specific task (this keyword will be expanded on later). The programmer's job is to give the Cloverbud representing Dash clear instructions on how to make a snowflake using the can of shaving cream. Here are the rules:

- The programmers can only talk to their Dash.

- They may not touch Dash.

- They may not show Dash the picture of the snowflake.

- Dash may move only on the command of the programmers.

▶ Programmers, your job is to get Dash to make a snowflake exactly like your picture. Does everyone understand? 3-2-1-go!

▶ Afterwards ask the Dash youth: Was it hard to do the commands? Why?

▶ Afterwards ask the programmers: Did Dash do what you wanted? Why or why not?

▶ Remind youth that the robots only do what the programmers tell it to. Repeat this activity as long as time allows. Be sure to rotate the role of Dash.

Snowflake cards to print and cut out for each team:
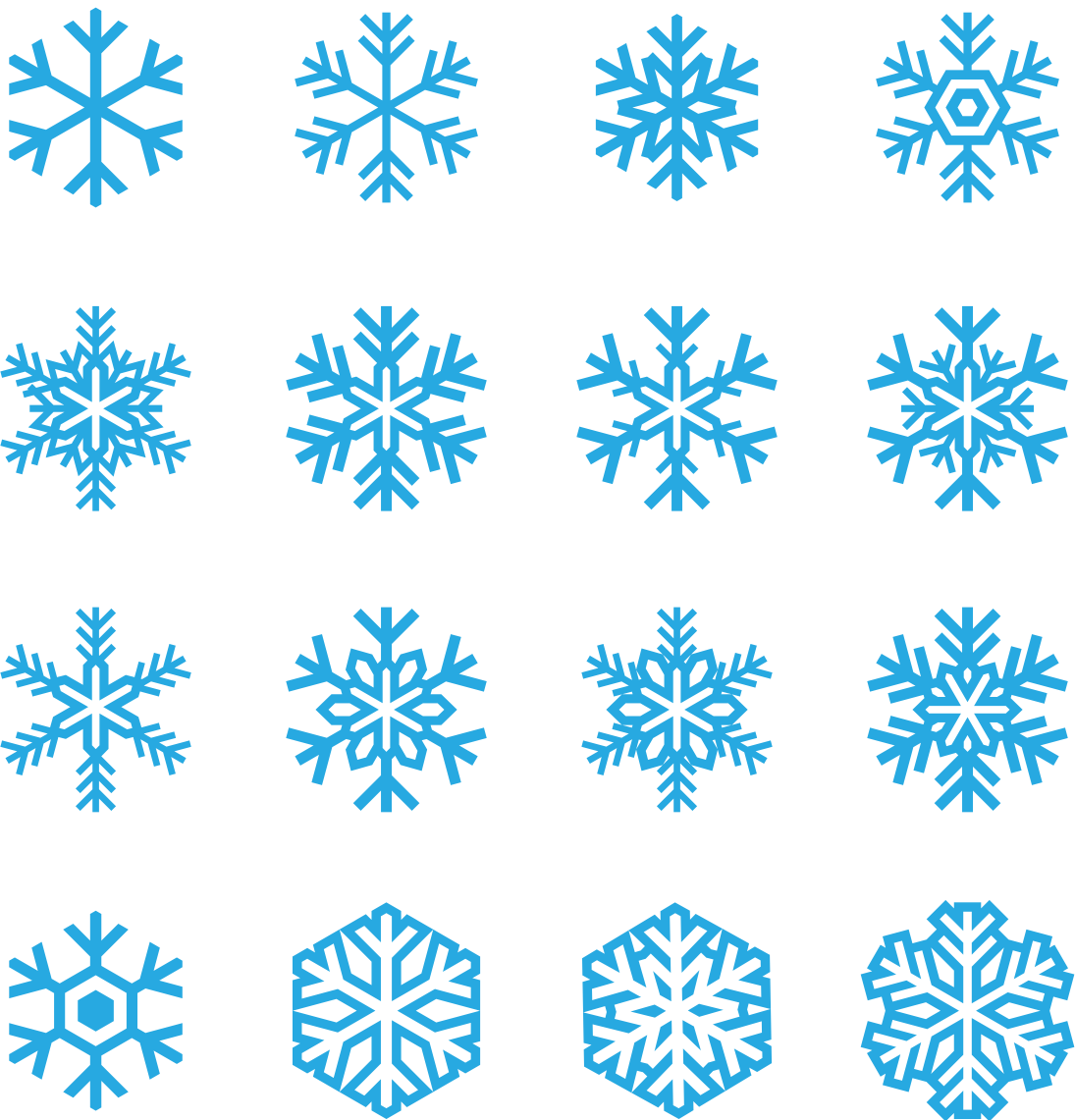
Read slide 11 of the Snow-tastrophe story.

Discuss

▶ In our story Dash signaled "SOS" –
what does that mean? SOS is the inter-
national signal for distress. If you are
in trouble, you can signal SOS.

▶ How do you signal SOS? SOS uses
something called Morse code. Morse
code is made up of dits and dahs. Ar-
en't those funny words? Dits are short
sounds. Dahs are long sounds. Let's
listen to the SOS code and see if you
can hear the dits and the dahs: http://
en.wikipedia.org/wiki/File:SOS_
morse_code.ogg

"**SOS**," signaled Dash as Reed typed out the code.
"Urgent help is needed to clear these roads."
One by one, their friends appeared on the computer screen.
They all said their robots would help them clean.

▶ Next, have the 4-H Cloverbuds tap out the SOS signal on the table. Call out the SOS code as they tap:
- (.) (.) (.)   (_) (_) (_)   (.) (.) (.)
- Dit, dit, dit,   dah, dah, dah, dit, dit, dit

▶ Increase the pace of tapping out the code until 4-H Cloverbuds can rapidly tap it out.

▶ In our story, Dash signals SOS. How do you think Dash could do that?

Experience

▶ We are going to use an app called Blockly to tell Dash how to signal SOS. Do you remember earlier
when we were making our shaving cream snowflakes? What happened? That's right! Dash had to wait
on you to give commands. When we create a series of commands to make a robot do something, that is
called programming. We need to figure out how to program Dash to signal SOS. Find the Blockly app on
your tablet and tap to open it up.

▶ Connect the volunteer leaders' tablet to the projector so youth can work along with you on the first set
of programming commands.

▶ When you open your Blockly app, what do you see? That is a sample program. Each of the blocks work
together to form a program. Your job is to figure out how to make Dash signal SOS.
- Do you see the button that says:

  When Top Button
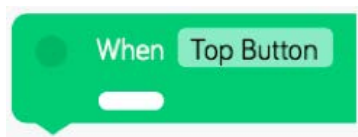
- Who remembers what that button does? Look back at
the Dash robot you colored.
- This button is how we will tell Dash to execute, or
start, the program we write.
- We need to get rid of the rest of this sample program.
(Show youth how to drag the program off of the page
by holding down their finger on the code and
dragging it to the garbage can that appears in the
bottom right hand corner).
- Now, how do we make the SOS signal? 3 dits, 3 dahs,
3 dits
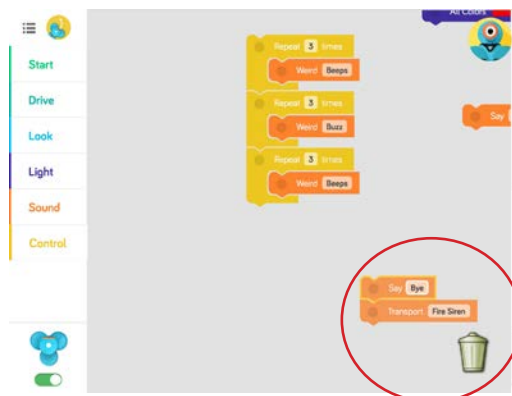
- So, we need a button that will allow to Dash to beep. Look at the programming commands. Do you see the one that says Sound? Tap the Sound block and see what each command will do. Which command do you think will work best to make the "S" (3 dits) in SOS? Use your finger to drag the command underneath the Start button (When Top Button)
- Dash has to beep three times to make the "S." It can be annoying to have to drag and drop the same block over and over again. There is an easy way to make Dash do the same thing over and over again. If we give Dash a loop command, Dash will repeat the same behavior for as long as we tell him to.
- Look at the Control button. Do you see the "Repeat three times" command? Drag that button underneath the Start button. Now drag your sound command into the loop block. The loop block will force Dash to do the same thing three times in a row.
- Now finish programming Dash to make the O and the S in our SOS distress call.

▶ Now that you have programmed Dash to give the signal with beeps, can you figure out how to make Dash give the symbol with Dash's LED lights? *Allow youth the opportunity to figure out how to make Dash's lights signal SOS.*

Dash Signals SOS with Sound

1. Tap the Blocky App to Open
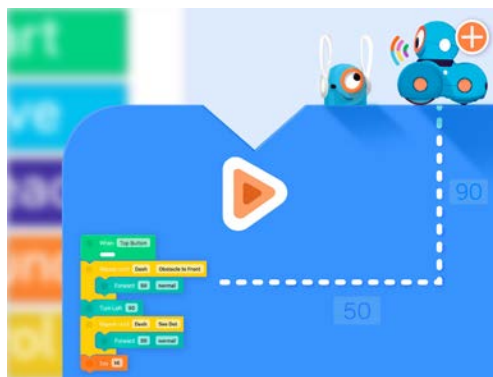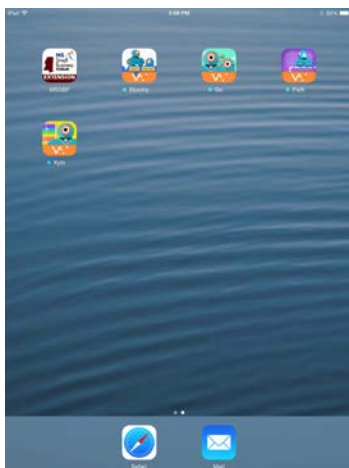
2. Connect Dash

Don't forget to make sure Dash is connected – use the plus sign in the upper right hand corner

3. Tap the Go Button

4. Program

Use the Control and Sound commands to create an SOS alarm

5. Execute the Commands

Press the top button on Dash's head to execute the commands

What sounds did you use to create the SOS alarm? Draw or write your sounds. Don't forget to draw the loop blocks too!

___ ___ ___   _____ _____ _____   ___ ___ ___

Dash Signals SOS with Lights

1. Tap the Blocky App to Open
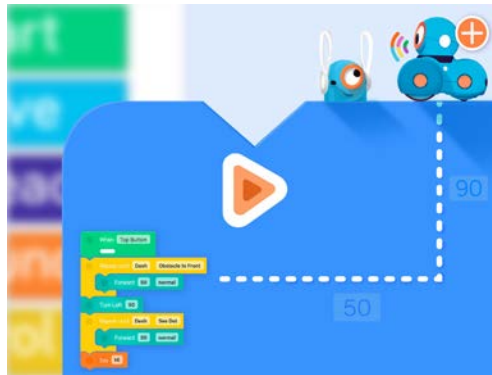
2. Connect Dash

Don't forget to make sure Dash is connected – use the plus sign in the upper right hand corner

3. Tap the Go Button

4. Program

Use the Control and Sound commands to create an SOS alarm

5. Execute the Commands

Press the top button on Dash's head to execute the commands

Share

▶ Once everyone has had an opportunity to create their lighted SOS, have each group stand up in front of the club and show their robot executing its commands. Ask them to explain how they programmed their robot. Connect their tablets to the projector to showcase programming if appropriate.

Process

▶ What did everyone's program have in common?

▶ Were there any problems that everyone seemed to have?

▶ How did you solve the problem?

▶ What did the loops help you do?

Generalize

▶ Watch this clip from Little Toot: http://www.cornel1801.com/disney/Melody-Time-1948/film4.html

▶ Can you think of a real life example where you might need to signal SOS? Can you think of a time when you could use a robot to call for help?

Apply

▶ Give each 4-H Cloverbud a CR2032 battery and a LED light.

▶ Can anyone remember what type of lights Dash uses? Look back at your color by number sheet if you do not remember.

▶ That's right, Dash uses LED lights. You have an LED light in your hand. Do you notice how the LED light has two tails? One is shorter than the other one. The short tail (cathode) is the negative end; the long tail (cathode) is the positive end.

▶ Now, look at your battery. Touch the positive tail to the positive side of the battery and the negative tail to the negative side of the battery. What happens?

▶ That's right! The LED lights up. See if you can make an SOS signal with your LED light.

SNOW-TASTROPHE UNIT 3: SNOWY POTION

Goals:

- ▶ To help 4-H Cloverbuds understand the need for safety when conducting experiments
- ▶ To work through the engineering design process to create attachments for Dash
- ▶ To facilitate the 4-H Cloverbuds use of the "Blockly" app to manipulate the Dash robot

Objectives:

4-H Cloverbuds will be able to

- ▶ Measure out a recipe for bubble solution.
- ▶ Follow safety instructions regarding the handling of dry ice.
- ▶ Build an attachment for Dash to use to blow bubbles.
- ▶ Program Dash using Blockly to blow bubbles.
- ▶ Build an attachment for Dash to clear roads.
- ▶ Program Dash to remove debris and clear roads.

Preparation:

- ▶ Purchase dry ice ahead of time and leave in a secure location
- ▶ Have heavy gloves and tongs available to handle dry ice.
- ▶ Place the ingredients for bubble solution at each group's table.
- ▶ Photocopy directions for making bubble solution (one per group)

Materials:

- ❏ Boo Bubbles Generator (Purchase for $24.99 at http://www.stevespanglerscience.com/boo-bubbles-dry-ice-smoke-bubbles.html or make your own: http://www.stevespanglerscience.com/lab/experiments/boo-bubbles-dry-ice-science)
- ❏ Dry ice (available at places that ship food)
- ❏ 1 cup warm water per group
- ❏ 2 tablespoons Dawn original dish detergent
- ❏ 1 tablespoon glycerin (available at craft stores or drug stores)
- ❏ 1 teaspoon of sugar
- ❏ Measuring cup for each group
- ❏ Measuring spoon for each group
- ❏ Bubble wands for each group (long bubble wands work best ~12 inches)
- ❏ 1 clear plastic cup for each group
- ❏ 1 plastic spoon for each group
- ❏ Safety goggles for each youth
- ❏ 100% cotton gloves (at least two pairs)
- ❏ Pencil for each youth
- ❏ Paper towels for spills
- ❏ Directions for making bubble soap (one copy for each group)

Read slide 12 of the Snow-tastrophe story.

Discuss

▶ Do you think you can you really capture snowflakes in a bubble?

Experience

▶ Dry ice can cause your skin to burn, so we must always be very careful with it. You must wear your safety goggles at all time and never touch the ice without an adult present and your gloves on!

▶ Tell the 4-H Cloverbuds that dry ice is frozen carbon dioxide. Carbon dioxide is a gas that doesn't have any color. It is made of molecules. Have we talked about molecules before?

"First things first," said Camila Mae, "we have to get rid of this snowy potion. It has caused quite the commotion." Reed picked up some parts that were laying about. He made an arm for Dash to try out. Into a liquid Camila Mae had made, Dash lowered his arm and then raised it and waved. Tiny bubbles began to fly, and they captured the snowflakes as they went by.

▶ Remind 4-H Cloverbuds that the snow was made up of molecules.

▶ Follow the direction on the Boo Bubble Generator or the do-it-yourself instructions found here: http://www.stevespanglerscience.com/lab/experiments/boo-bubbles-dry-ice-science

▶ When the dry ice is placed inside the plastic bottle with the warm water, it melts from a solid into a gas (carbon dioxide). The gas builds up in the bottle until it forces the dry ice smoke into the tube. Once the tube touches the bubble solution, it begins to make a bubble, and all of the smoke is forced inside the bubble.

▶ Allow each youth to create a boo bubble. Be prepared to do the experiment again as parents come in to pick up their child.

The rest of this lesson will take place on Day 2.

Recharge/Clean-up Time: (10 minutes)

▶ Ask one youth from each group to plug Dash in so that he can recharge his batteries.

▶ Ask one youth from each group to plug in their tablet.

▶ Have all of the youth clean up their work areas.

▶ Once clean-up is done, have youth reassemble around the boo bubble experiment station. Review key concepts from the day as parents are picking up. For each correct answer, create a boo bubble for that child.

▶ Key concepts questions:
  • What is a program?
  • How do we signal SOS?
  • What is an app?
  • What is a polymer?
  • What is carbon dioxide?
  • What is the 4-H pledge?
  • What is an LED?
  • What is a hypothesis?

DAY 2

Welcome (10 minutes)

Welcome to our 4-H Robotics Club meeting! Let's begin by saying the 4-H pledge:

I pledge
My Head to clearer thinking,
My Heart to greater loyalty,
My Hands to larger service, and
My Health to better living,
For My Club, My Community,
My Country, and My World.

If necessary, remind youth of the camp rules. Ask for volunteers to share what their favorite activity was from the previous day or what they learned.

Unit 3/Building Block 2 (45 minutes)   Dash Captures the Snow Bubbles

Discuss

▶ Have you ever made bubbles? Where did you get the bubble soap? Today we will make our own bubble soap!

Experience

▶ Ask the youth to follow the directions for making bubbles. Older youth may need to help the 5-year-olds read the directions and pour out the correct measurements. Demonstrate if needed.

- Bubble Solution:
  - 1 cup warm distilled water per group
  - 2 tablespoons Dawn original dish detergent
  - 1 tablespoon glycerin (purchase at craft stores or drug stores)
  - 1 teaspoon of sugar

  Mix ingredients together. This solution is best if left out overnight, but since time does not permit, either use it as-is or make several batches the day before for Cloverbuds to use. Youth can use their solution at break or take it home to use.

▶ Show youth the plastic bubble wand. Ask them to draw their own bubble wands. Give each Cloverbud a pipe cleaner and let them create their own bubble wands. Allow youth to blow a few bubbles before reminding them that Dash also needs to blow bubbles to capture the snow potion. Re-read slide 13 of the story.

Share

▶ How could Dash create bubbles if he has no arms or hands?

▶ Give each group a plastic bubble wand. Direct them to the building block extension pieces and the LEGO blocks.

▶ Ask youth to brainstorm their ideas for creating an arm for Dash to use to hold the bubble wand. Record these ideas by having youth draw them. Have several youth share their designs with the group.

Process

▶ Decide on a design and create a working "bubble arm." There is a sample building guide below, but give Cloverbuds the opportunity to surprise you with their designs before stepping in with the building guide. There are many ways to engineer a solution.

▶ After youth have created the attachment, have them open the Blockly app. Can you create a program for Dash's arm so that he can blow bubbles and capture the snowy potion?

▶ A programming guide is available for the bubble arm building attachment on page 37. Use it as a guide when helping youth create their program. Have youth count the number of bubbles Dash makes and record the number.

▶ What design worked best?

▶ Was there a time when Dash did not work? What did you do?

▶ Can you think of something that uses a robotic arm?

▶ Do you think a person, like me or you, might need a robot arm?

Generalize

▶ Robots are fun and can also be helpful. We are going to watch a video of how a group of engineers, like you, helped create a new robotic arm.

▶ Watch this video: http://www.cnn.com/2015/03/06/health/ucf-3d-printed-arms-for-kids/

▶ What did you think about his "Transformer" arm?

▶ Do you think you could help someone by engineering a robot?

▶ What kind of robot would it be?

Apply

▶ Draw the robot you would design to help someone.

Dash Create Bubbles Building Guide

Allow youth an opportunity to build an arm for Dash to hold a bubble wand. For this build, we used a long bubble wand for best results. Experiment with short wands and homemade wands created from pipe cleaner.

Dash Creates Bubbles Programming Guide

1. Tap the Go App to Open
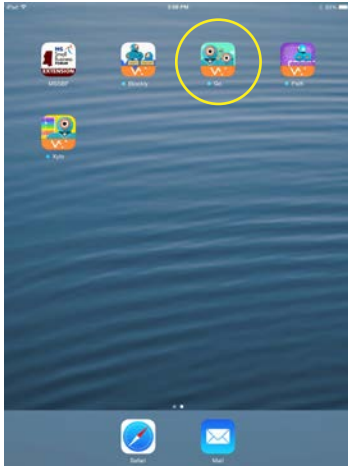
2. Be sure Dash is connected to the tablet.
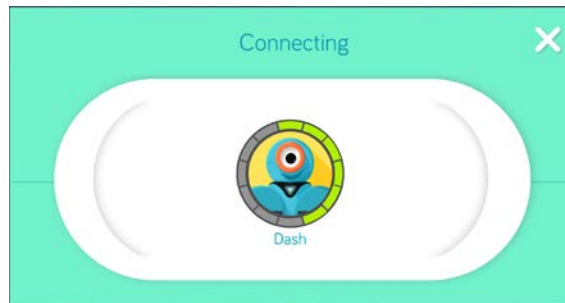
3. Use the Yes/No rectangle (pan & tilt) to move Dash's head back and forth very fast to create the bubble potion.

Use your finger to move Dash's head back and forth or up and down.

GO FURTHER:

Could you create an arm for Dash so that he could dip the wand into the bubble solution?   (Circle One)

TOTALLY   PROBABLY SO   IT WOULD BE DIFFICULT

Which app would you use to raise and lower the bubble wand? (Circle One)

Which app would you use to blow bubbles? (Draw a square around it above)

How could you use a robotic arm to help your community?

_____

_____

UNIT 4: CLEARING THE ROADS

Goals:

▶ To discuss how robots can help people

▶ To learn to work together to accomplish a goal

▶ To use measurements to create programs

Objectives:

▶ 4-H Cloverbuds will be able to

▶ Program the robot to move a specific distance.

▶ Use the loop block to minimize repeat commands.

▶ Work in groups to develop a strategy to accomplish a specific task.

▶ Describe how magnets work.

Prepare:

▶ Set up a small town for Dash to navigate. See sample town on page 39.

▶ Print out the Degrees game pieces and cut them out. See pages 46-50.

Materials:

❏ Electrical tape or masking tape

❏ Boxes or books to create a "town"

❏ 30-40 ping pong balls

❏ Small metal cars

❏ A set of magnetic and non-magnetic items for each group

  • Magnetic (paper clips, pennies, scissors, nuts and bolts)

  • Non-magnetic (ping pong balls, pencil, crayons)

❏ Ruler and yardstick with metric readings for each group

❏ Pencil for each youth

Note:

This activity can also be completed using cotton balls. Please see

http://www.thedigitalscoop.com/the_digital_scoop/2015/01/dash-and-dot-robots-dash-on-snow-patrol.html and

http://www.thedigitalscoop.com/the_digital_scoop/2015/02/dash-and-dot-robots-build-a-better-bulldozer.html for more information.

Setting Up the Snow-tastrope Town Guide

210cm

50cm

40cm

8

7

50cm

30cm

3

40cm

20cm

2

80cm

6

5

4

30cm

1

20cm

50cm
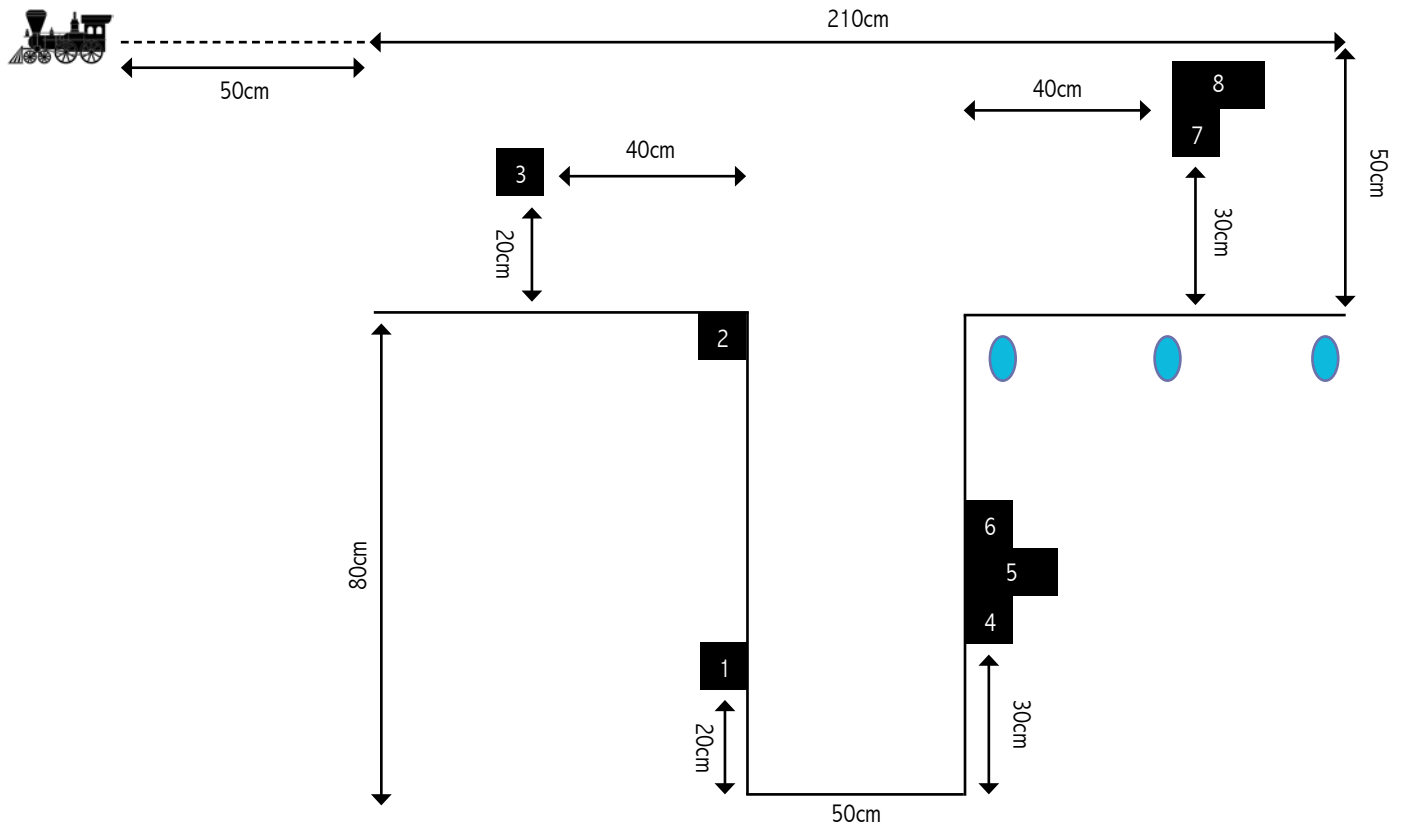
Represents an electrical line. Electrical lines are made out of Lincoln logs set 15 inches apart with yarn for line. Limbs are 6" cut pipe cleaners.

Represents a car. Mark the area you put a car with electrical tape so you can set the cars back up more easily after each group test their programming.

The engine for the train should be placed 50 cm from the edge of the town. The train should be parallel with the town. The train used for this curriculum was the Fisher-Price Thomas & Friends Track Master Motorized Railway 5–in-1 set.

Read slide 13 from the Snow-tastrophe story.

Discuss

▶ Show youth the "snowy" town.

▶ The ping pong balls represent the snow. Dash needs to remove the snow from the roads without hitting any cars. How do you think you could help Dash remove the snow? How would Dash make it down the road?

Experience

▶ Dash can travel small distances and long distances based on what commands we give him. Let's see how far Dash can go.

Out on the street was another matter: the roads were still a snowy disaster.

Into the streets Dash must go to help clear away those piles of snow.
Reed messaged their friends, and each set to work, helping their robots adjust their torque.
Soon the robots were headed out to see what this mess was all about.
They soon found cars and trucks by the stack, all full of drivers in need of a snack.

▶ Give each group a ruler. Ask youth to open the Blockly app on their tablet. Remind youth to connect their tablets to the Dash.

▶ What command should we use to start Dash? Allow youth to choose their start command. Now, tap the Drive command. Do you see the command that says Drive Forward 50 Fast?

▶ Drag that under the Start command. Forward is the direction the robot will move. What do you think 50 stands for? 50 stands for distance. Tap 50. What do you see? Each block on the forward arrow equals 10 centimeters. Look at your ruler and count 10 centimeters. How many inches is that?

▶ Have students measure for 10, 20, 30, 40, 50, 60, 70, 80, and 90 Drive commands using a yardstick or ruler.

▶ On your drive forward button, look to the right. Do you see the speed button? There are five speeds: very slow, slow, normal, fast, very fast. Use your finger to change the speed. If you move the dial towards the minus button, the speed will get slower. If you move the dial toward the positive button, it will get faster. Find the normal setting.

▶ It is a very long way for Dash to get down the road. How many centimeters will it take for Dash to travel down the road?

▶ Students can use their rulers to measure the distance needed to program Dash. Remind Cloverbuds that they can use the loop block to shorten their code. This is one possible programming option:
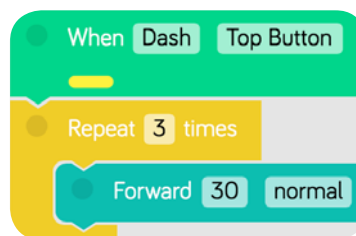
Note: Dash executes commands better on hard flooring (tile or concrete). Dash doesn't turn well on carpet.

▶ Allow youth to test their program and make changes. Once youth have had a chance to create a working program, bring youth back to the town. Show them how the road turns to the right and to the left.

▶ How will Dash know to make the turn? Let's look at our app. Under the Drive command, there is a Turn Right and a Turn Left command. Which way do you want Dash to go? Drag the Turn command under your forward command. Tap the number 90: do you see the circle? The circle shows us all of the degrees Dash can turn. Right now, Dash is set to turn 90 degrees. What does a 90-degree turn look like? Demonstrate what Dash will do with if programmed to make a 90-degree turn. Ask youth to demonstrate making a 90-degree turn with their bodies like they are Dash.
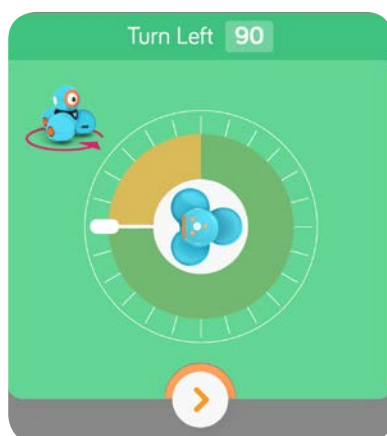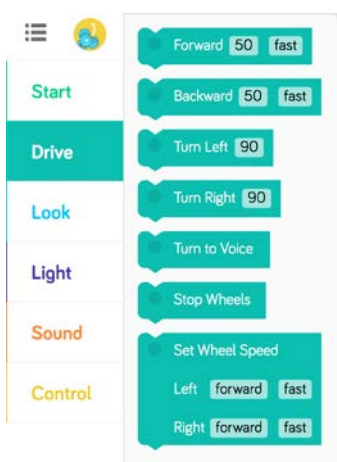
Each white line on the circle represents a degree Dash can turn.
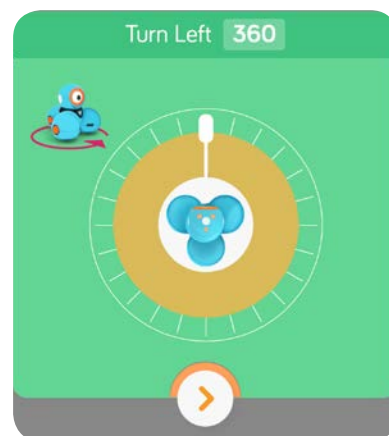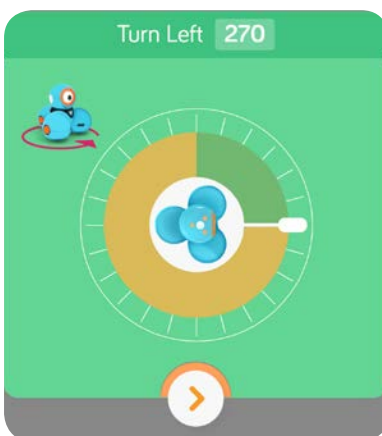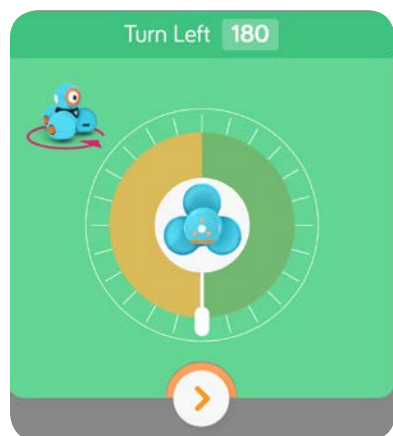
▶ Show youth how to drag the dial to the 180-degree mark. What does a 180-degree turn look like? Demonstrate what Dash will do with if programmed to make a 180-degree turn. Ask youth to demonstrate making a 180-degree turn with their bodies as if they were Dash. Repeat for 270 degrees and 360 degrees. Ask youth what degree they should choose so that Dash can make the turn.

▶ Allow youth an opportunity to experiment with the turn command. After youth have had a chance to determine which turn is best for their group, bring everyone back to the town.

▶ Now that you know how to program, you must help Dash clear the roads. All of the ping pong balls represent snow! You and your partner need to figure out how to program Dash to clear the roads. You might have to build something for Dash, and you will definitely need to program Dash to remove the snow. Your goal is to get as many ping pong balls as possible off the streets!

▶ Use the programming guide for ideas.

Share

▶ Ask groups to show their programming to others.

Process

▶ Have groups explain how they came up with their program.

Generalize

▶ Watch this video: http://www.engadget.com/2009/05/29/video-dustbot-will-clean-up-the-eurotrash/ and ask youth if they think their robot could clean up like the one in the video. What else could your robot do?

Apply

▶ What kind of robot would you build to help keep your city clean?

▶ Youth will apply what they have learned in this lesson to the next lesson where Dash removes cars.

Dash Clears the Road Building Guide

Dash Clears the Road Programming Guide

Start at the end of the town on Main Street.
Be sure to connect the programming on the right to the programming on the left by dragging it underneath

1. Tap the Blocky App to Open
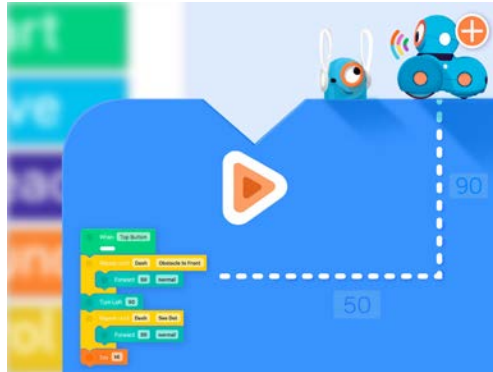
2. Connect Dash

Don't forget to make sure Dash is connected – use the plus sign in the upper right hand corner

3. Tap the Go Button

4. Clear snow on all streets (This is a lot of programming for Cloverbuds. Consider breaking it down into streets (Main, Left, and Right Street.)

Programming By Street:
(Remember: these should be attached.)
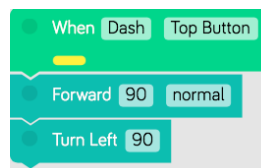
1. Main Street:

2. Left Street:

3. Right Street:

4. Back down Main Street:
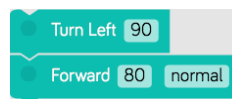
Snack (15 minutes)

- ❏ Popcorn and M&M candy cups
- ❏ Strawberries
- ❏ Apple Juice

Teamwork Activity (15 minutes)

▶ Play the Turn This Way, Turn That Way game. Instructions below.

To create the Turn This Way, Turn That Way game, use the print outs below and arrange your "degrees" on the floor like the example below. Allow up to four youth at a time on the game at one time. Two youth should stand on the 45 end of the mat and two youth on the 360 end of the mat. Youth should place one foot in one orange 45° circle and one foot in a red 90° circle. Repeat for the other 45° team member. The two youth on the 360° end of the mat should place one foot in a yellow 360° circle and one foot in a 270° circle. Tell youth that only their hands and feet can touch the mat. Tell youth that when you call out the card (example: Right Foot/270), they must try and get to that color (in this example, the Cloverbud would place the right foot on a green circle). If they fall, or a knee or elbow touches the floor, they must go to the end of the line. Shuffle the cards and call them out one at a time.

45	45	45	45	45
90	90	90	90	90
180	180	180	180	180
270	270	270	270	270
360	360	360	360	360
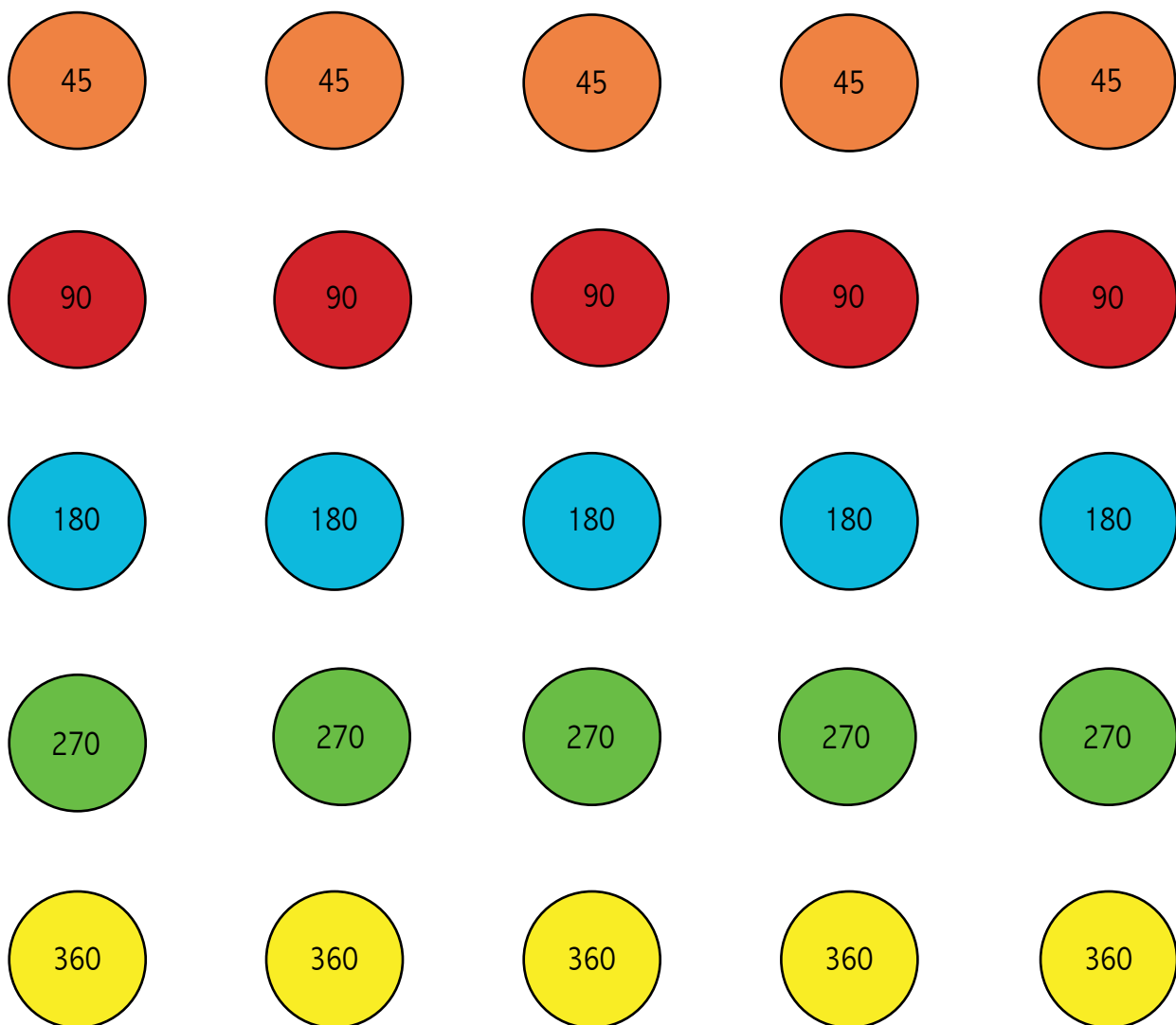
Turn This Way, Turn That Way Call Out Cards: Print these cards and cut them out. Shuffle them and call them out to participants.

Left Foot/360	Right Foot/360	Left Hand/360	Right Hand/360

Left Foot/270	Right Foot/270	Left Hand/270	Right Hand/270

Left Foot/180	Right Foot/180	Left Hand/180	Right Hand/180

Left Foot/90	Right Foot/90	Left Hand/90	Right Hand/90

Left Foot/45	Right Foot/45	Left Hand/45	Right Hand/45

Twister Game Pieces
Print 5 of the 45-degree circles and cut them out. Or use paper plates and have the youth cut the degree turn out and color the plate orange.

45
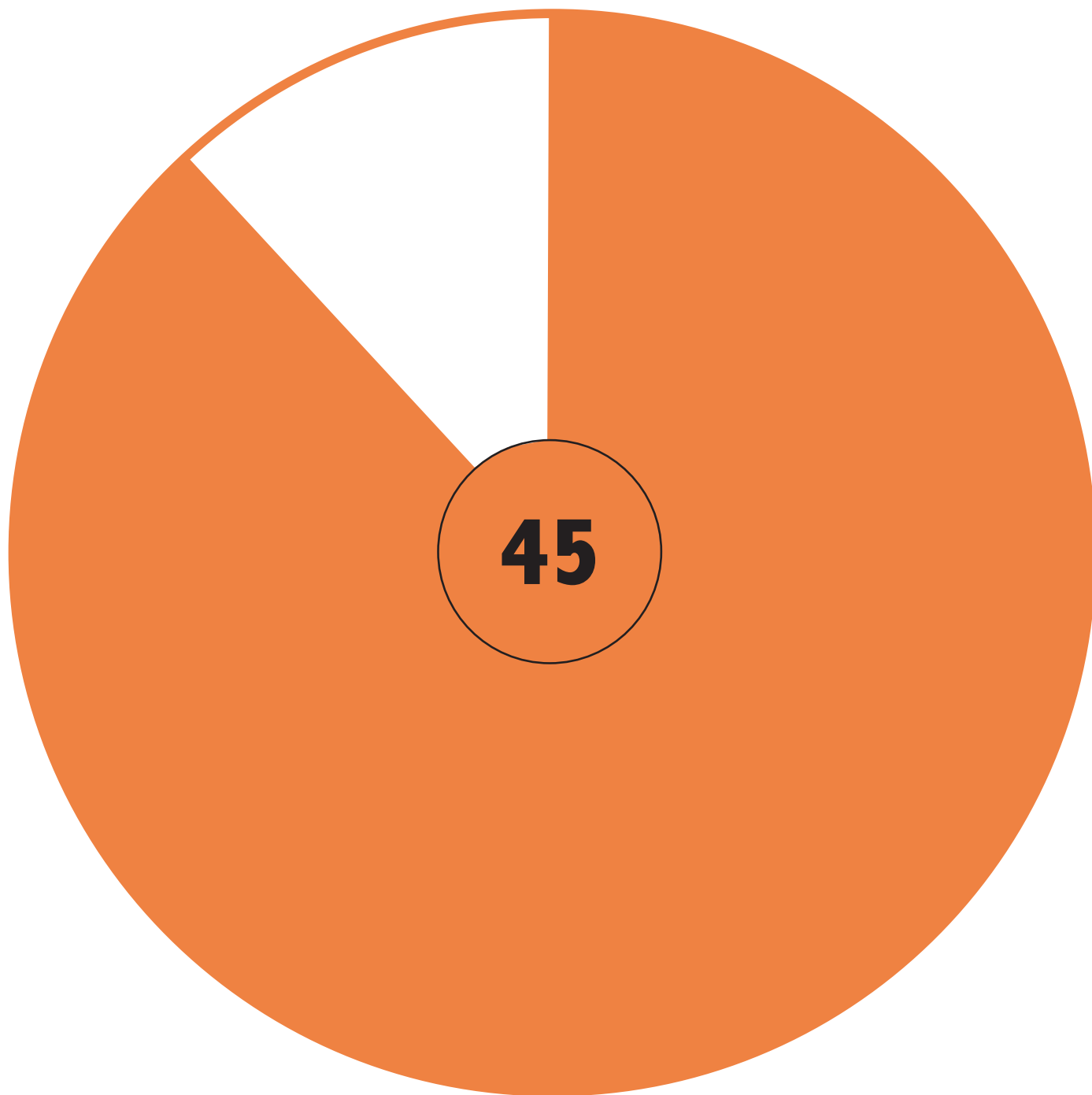
Twister Game Pieces
Print 5 of the 90-degree circles and cut them out. Or use paper plates and have the youth cut the degree turn out and color the plate red.
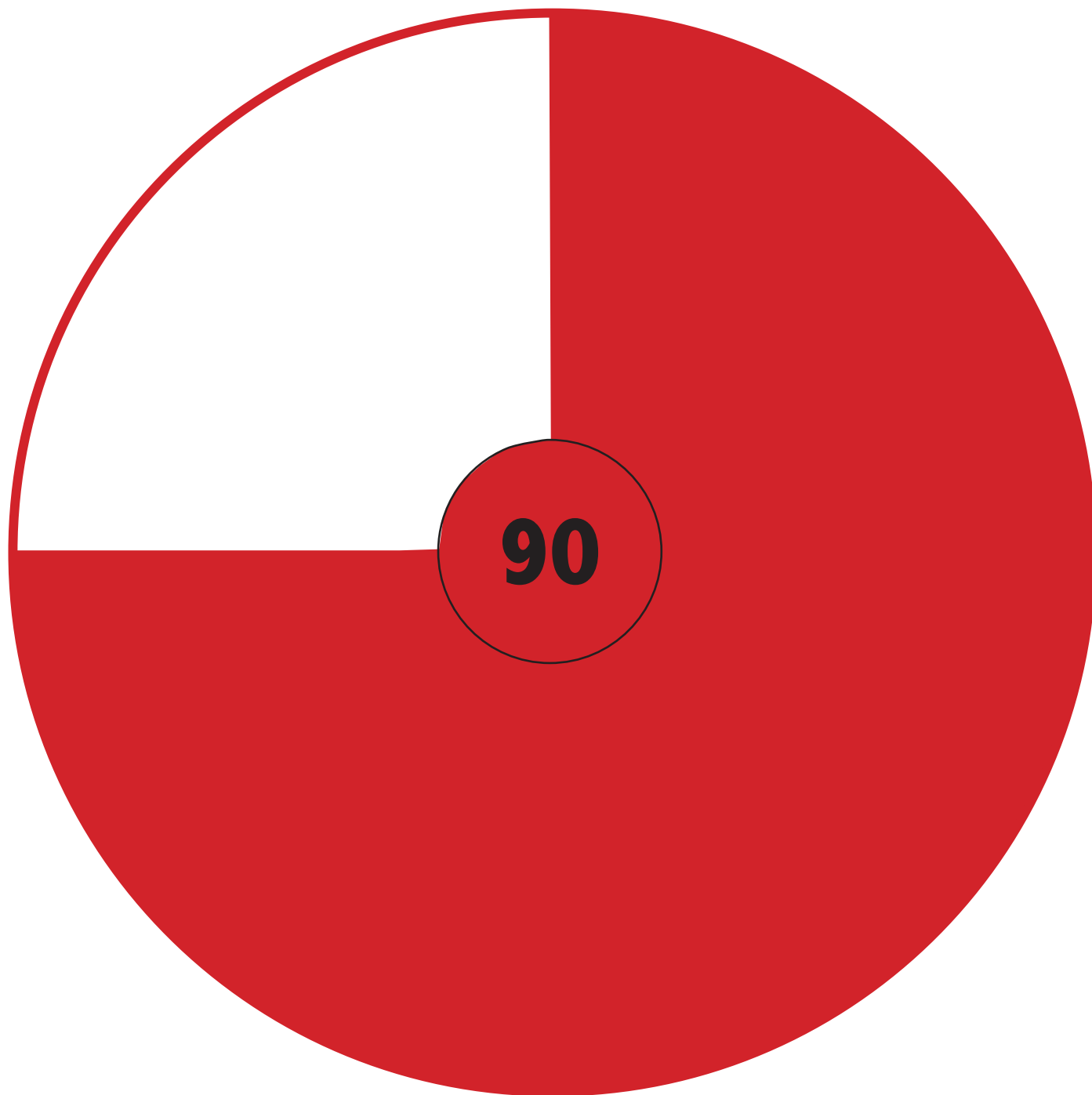
Twister Game Pieces

Print 5 of the 180-degree circles and cut them out. Or use paper plates and have the youth cut the degree turn out and color the plate blue.
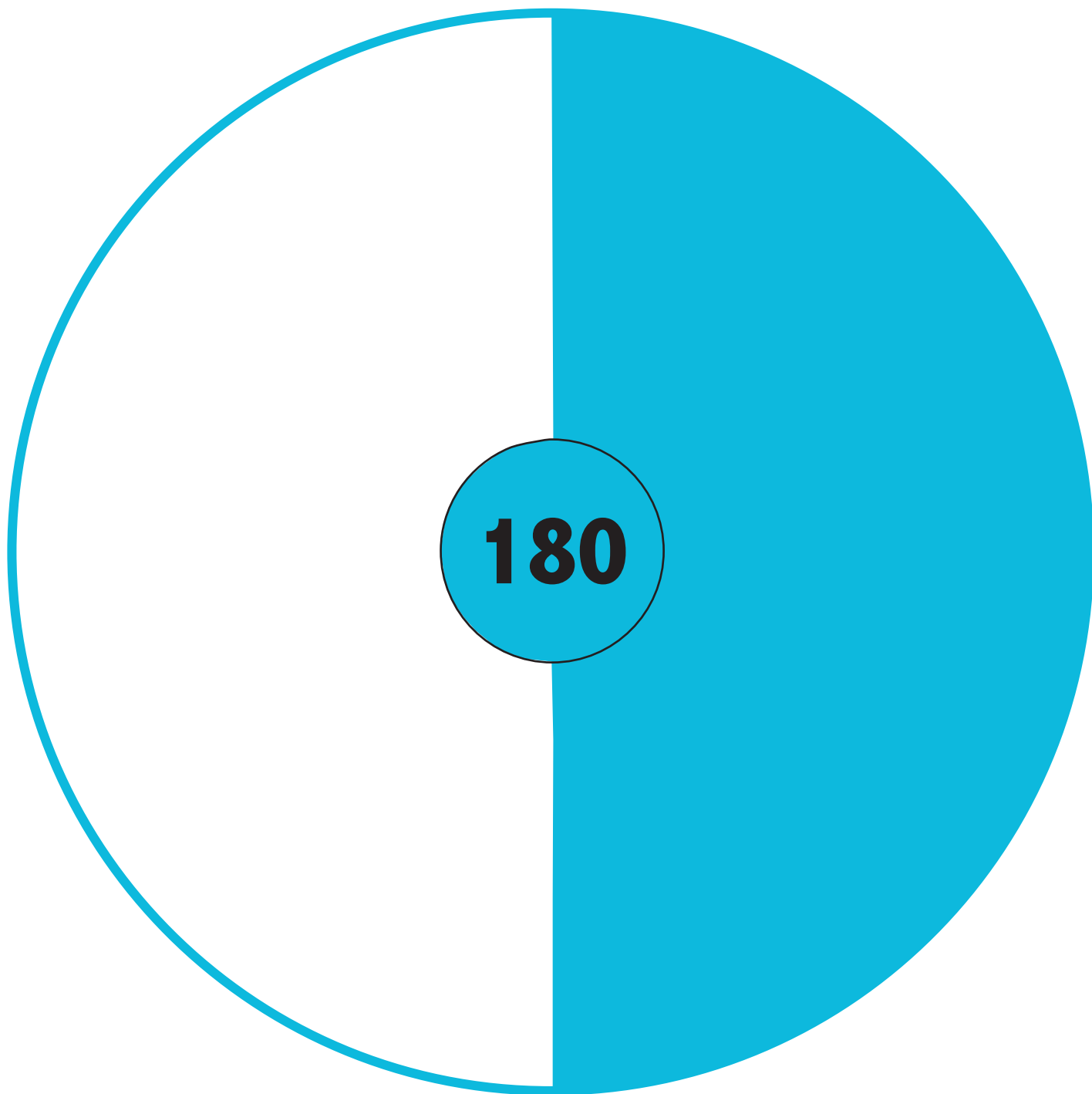
Twister Game Pieces

Print 5 of the 270-degree circles and cut them out. Or use paper plates and have the youth cut the degree turn out and color the plate green.

270
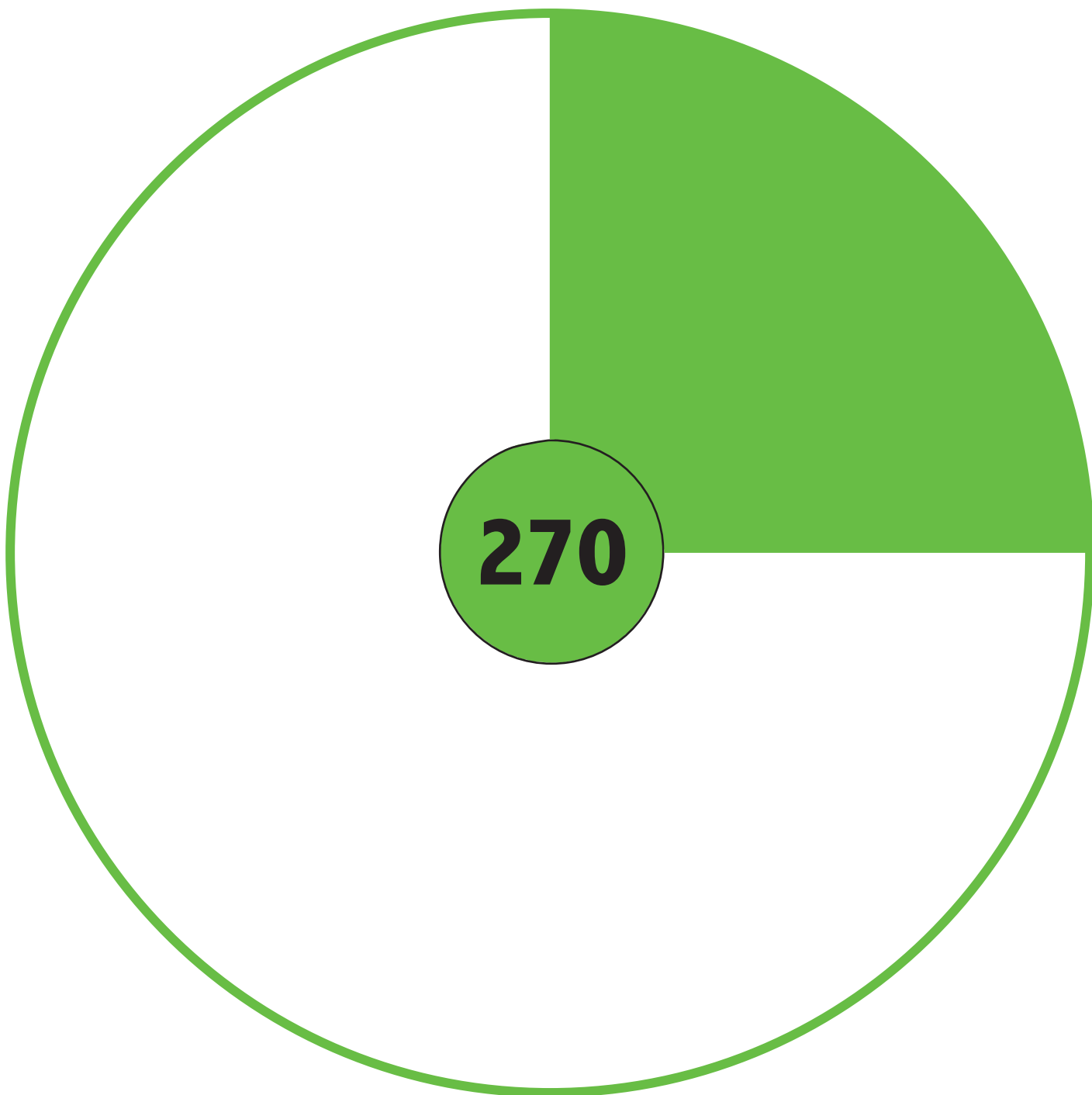
Twister Game Pieces

Print 5 of the 360-degree circles and cut them out. Or use paper plates and have the youth cut the degree turn out and color the plate yellow.

360
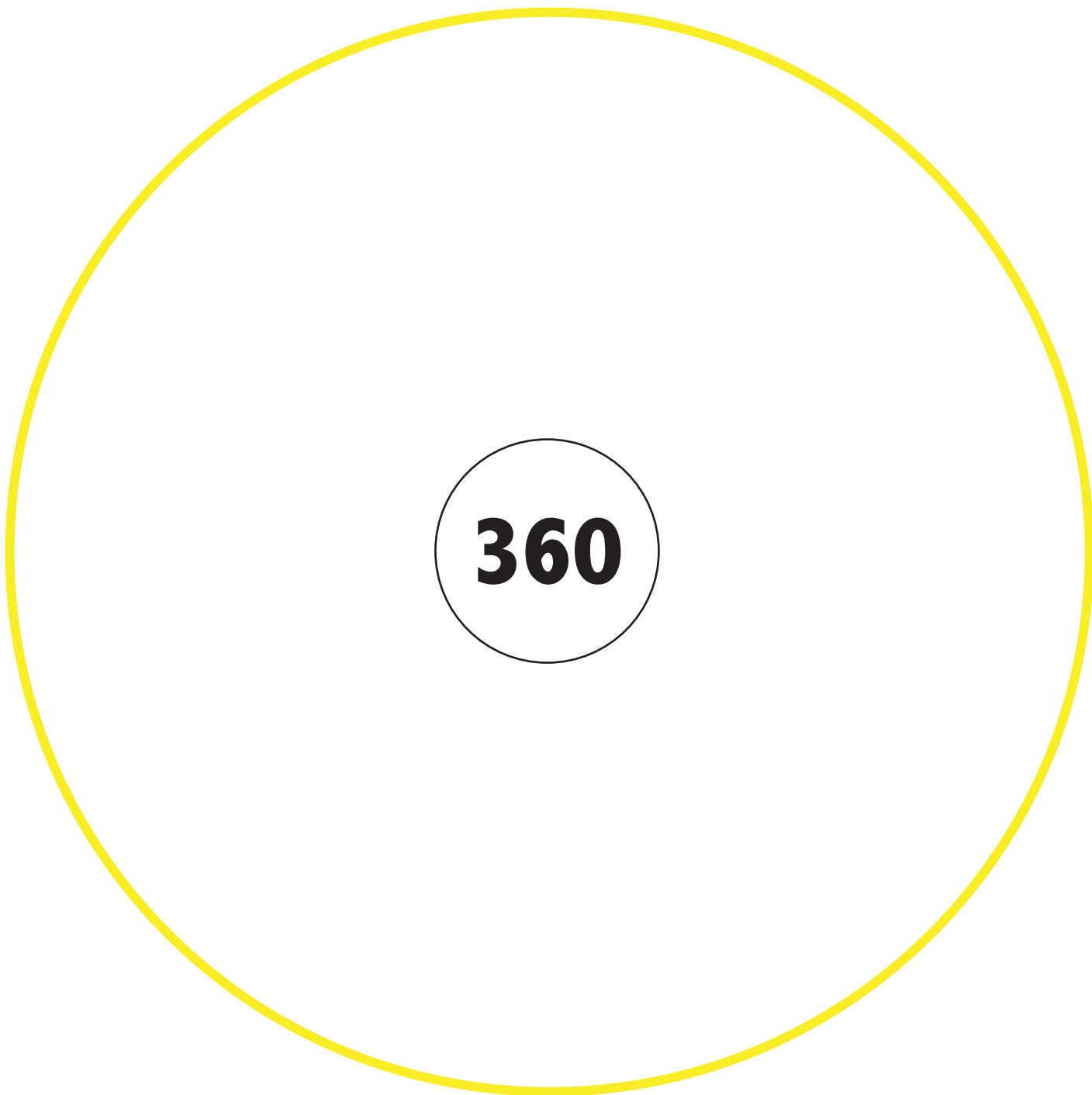
Before this unit, refer to the Town Setup Guide to make sure the cars are in the correct location.

Read slide 14 of the story Snow-tastrophe.

Experience

▶ We got the snow off the streets, but now we need to get the cars off of the road. Let's go back and look at our town to see what we can do. Do you see where all of the cars are stacked up? How will we get them out?

▶ What are cars are made of? Metal

▶ Take out one of the magnets and show youth how the magnet attracts the car through its magnetic field. Magnets have a north pole and a south pole. When we hold the north pole of one magnet near the south pole of another magnet, they are attracted to each other. But, if you put the north pole of the magnet with the north pole of another magnet, they are repelled away from each other. Metal doesn't have poles, though, so cars are attracted to magnets no matter which pole of the magnet you use. What are some other things that are attracted to magnets? Examine the materials on your table with your magnet. Which ones are magnetic? Which ones are not? Circle the objects that are attracted to your magnet on the activity sheet called Dash Uses Magnets.

▶ Tell youth they may attach their magnet to Dash if they would like to. Allow youth to brainstorm their ideas for removing the cars. Give youth time to develop their program and test what they have written.

▶ When it looks like everyone has completed their program, have everyone meet around the town.
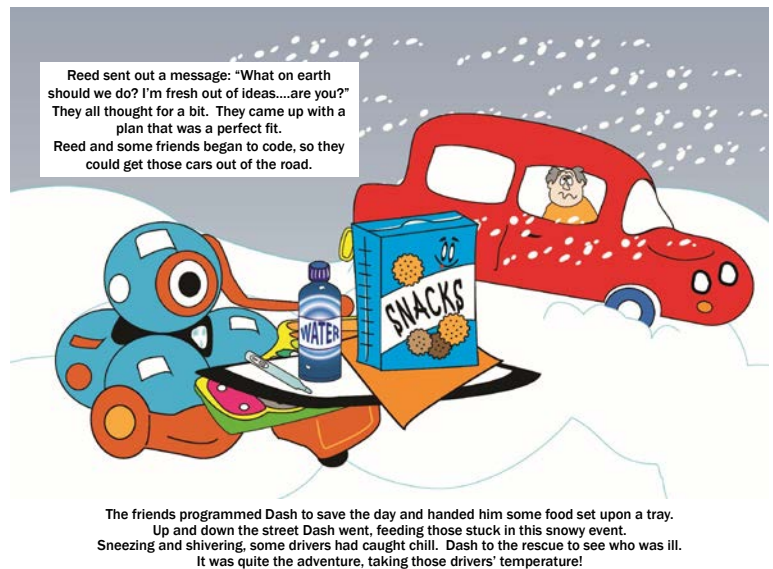
Share

▶ Ask each group to show what their robot can do.

▶ Discuss code that worked and code that did not work.

▶ Ask for volunteers to reset the cars.

Process

▶ What are some things that everyone's program had in common?

▶ What were some things that were different?

▶ How could you improve your program?

Generalize

▶ Did you think it was easy or hard to get the cars out of the snow? Let's watch this video.

▶ Watch about the first 50 seconds: http://www.huffingtonpost.com/2014/01/29/winter-storm-south-_n_4685463.html

▶ How would you get those cars out of the road?

▶ Do you think it would be hard for a robot to move on snow and ice?

Apply

▶ How was this program written differently from the one you wrote to remove the snow?

▶ Could you add flashing lights when Dash finds a car or a siren to let people know about a stranded driver?

Dash Removes the Stack of Cars Building Guide
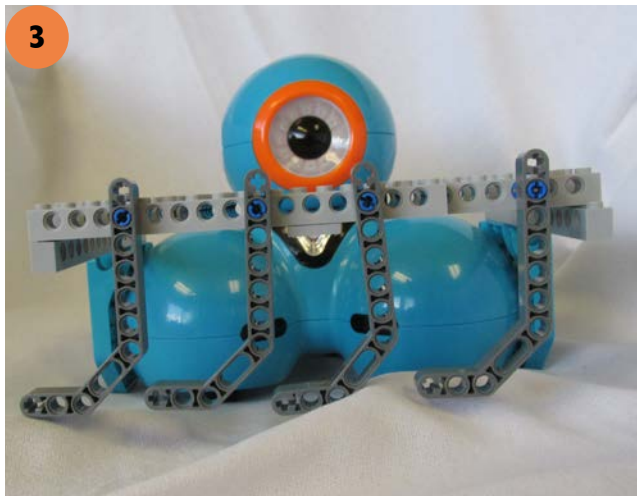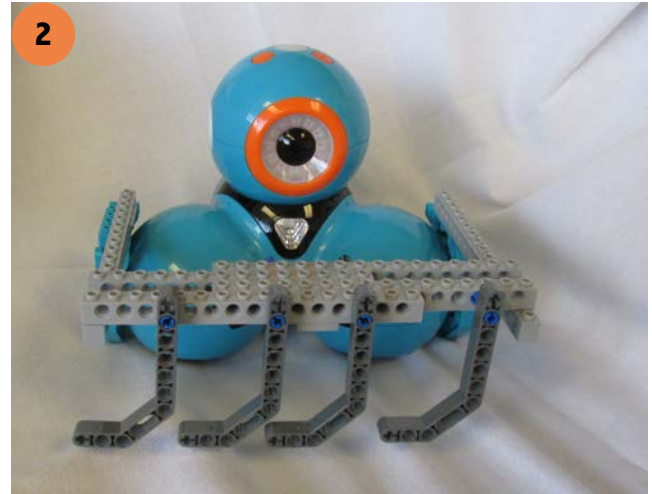
Dash Removes the Stack of Cars Programming Guide
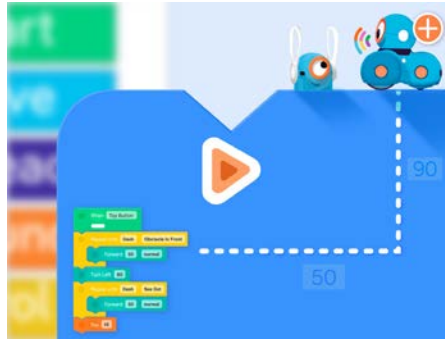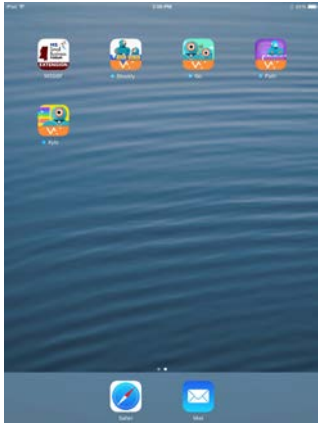
1. Tap the Blocky App to Open

2. Connect Dash

Don't forget to make sure Dash is connected – use the plus sign in the upper right hand corner

3. Tap the Go Button

4. Program removing the stuck cars. This is a lot of programming for Cloverbuds to do. Consider breaking it down into streets (Main, Left, and Right Street.)
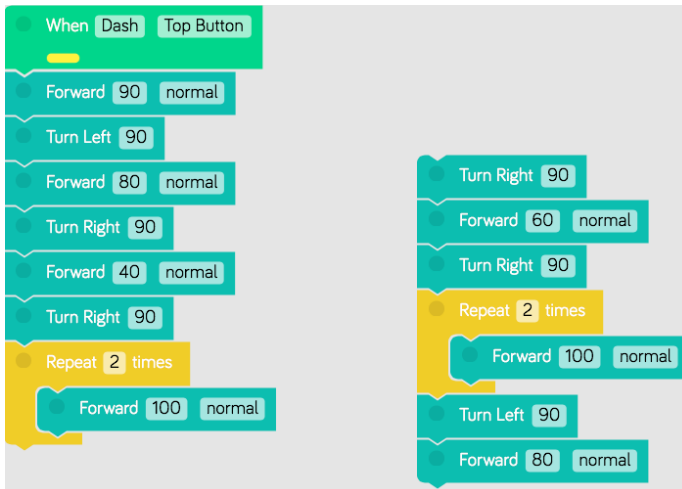
Programming By Street:
(Remember: these should be attached.)

1. Main Street:
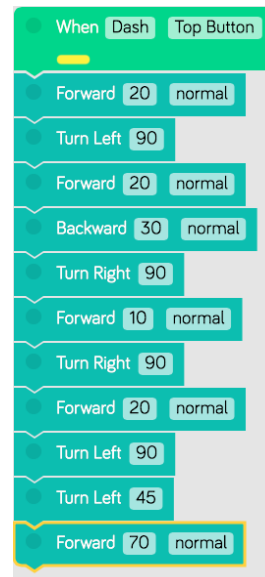
2. Left Street:
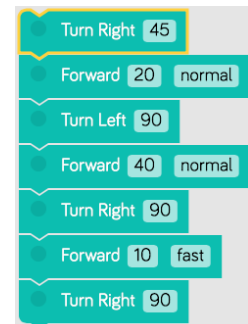
3. Right Street:
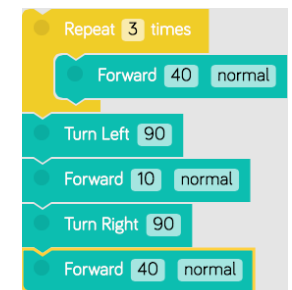
UNIT 5: OFFERING A HELPING HAND

Goals:
▶ To recognize that robots can help people.
▶ To develop an understanding of sensors.

Objectives:
4-H Cloverbuds will be able to
▶ Program Dash to respond to voice commands.
▶ Use a thermometer to take the temperature of ice water, room temperature water, and warm water.

Prepare:
▶ Small cups of ice water, room temperature water, and warm water for each group

Materials:
❏ Pencil for each youth
❏ A digital thermometer for each youth or a thermometer for each group with plastic sheaths for each child
❏ 1 cup of cold water for each group
❏ 1 cup of warm water for each group
❏ 1 cup of hot water for each group (run water through a coffee machine)
❏ Small cups for water and snacks
❏ Xylophone accessory

Unit 5/Building Block 1: (45 minutes)   Dash Hears the Call

Read slide 15 of the Snow-tastrophe story.

Discuss
▶ Tell youth that Dash has ears so that he can hear! Ask youth if they can find Dash's "ears."
▶ Dash's ears are called sensors because they can "sense" sounds, such as voices or clapping.

Experience

▶ Sometimes we need robots to help us. In our story, the drivers are stuck and need help! We are going to program our robots to respond to the drivers' cries for help. What should we do first? Build a snack tray for Dash or program Dash?

The next task on the list for these coding friends was to
program Dash to remove broken limbs.
Tweaking this, adjusting that –
those coding kids had it all down pat!

▶ How is Dash going to deliver all those snacks? Working with your group, design a way for Dash to carry snacks to the drivers.
▶ Remind youth that Dash might hit a patch of slick ice, so they need to design their attachment so the snacks don't get dropped! Once youth have had a chance to build their robot attachment, move into programming.
▶ Open the Blockly app and tap Start. Select the command that says When Dash Top Button. Drag it to the programming palette. Tap Top Button and look at the options.

Do you see a command that Dash could use to hear? If our drivers are calling out for help, which one should we select?
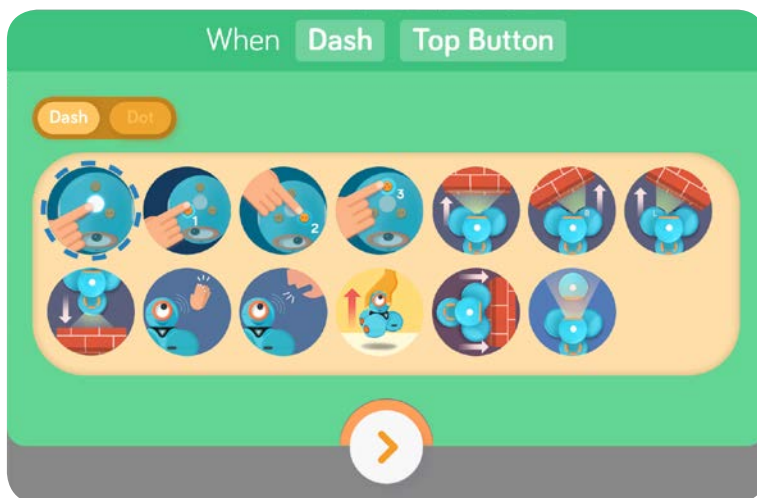

Tap Hear Voice.
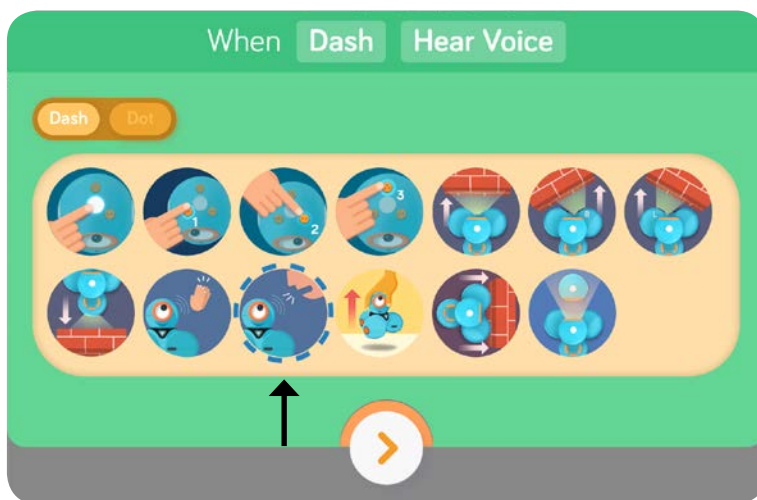
▶ This command means that when Dash hears the driver's voice, he will do something, but we have to tell Dash what that something is. Do we want Dash to turn toward us, or drive to us? If Dash is going to take the drivers a snack, he needs to move toward the drivers.

▶ What command should we use next?

▶ Work with youth to come up with a program that will move in the direction of their voices. Keep in mind the location of the sound sensor and the fact that everyone may have to be quiet while one group is talking to their robot. Use the Dash Hears the Call Programming Guide as a reference.

Dash Hears the Call Programming Guide
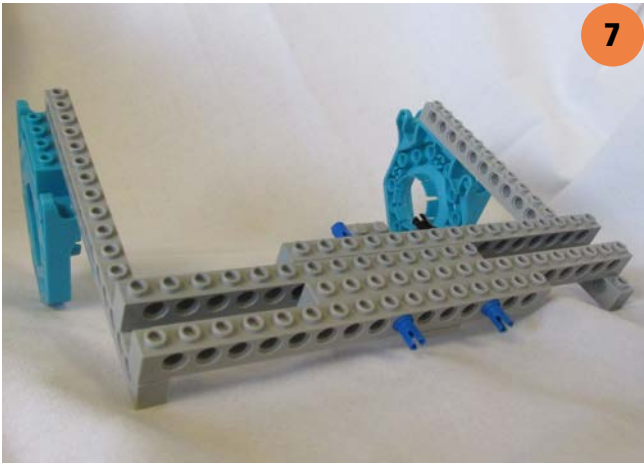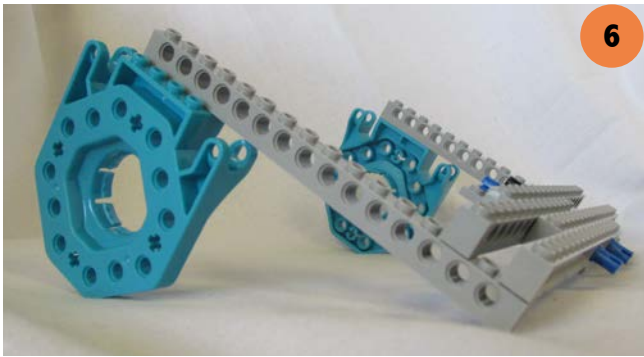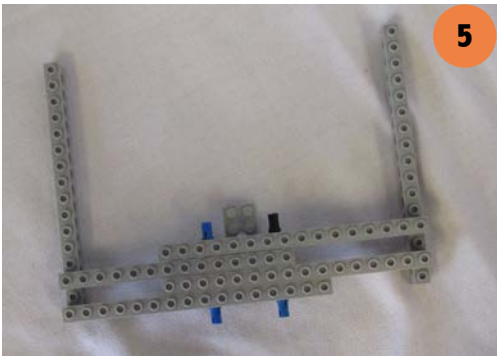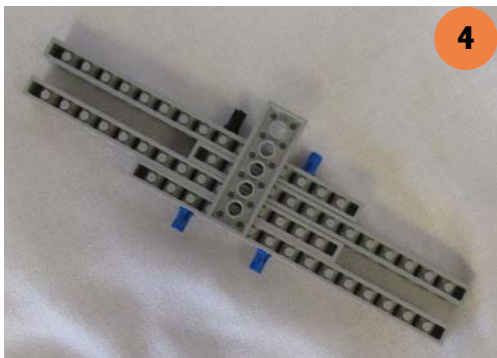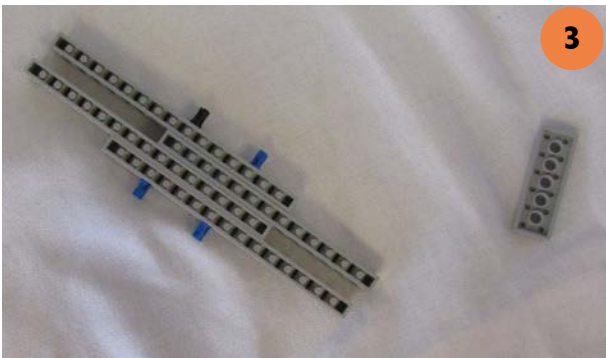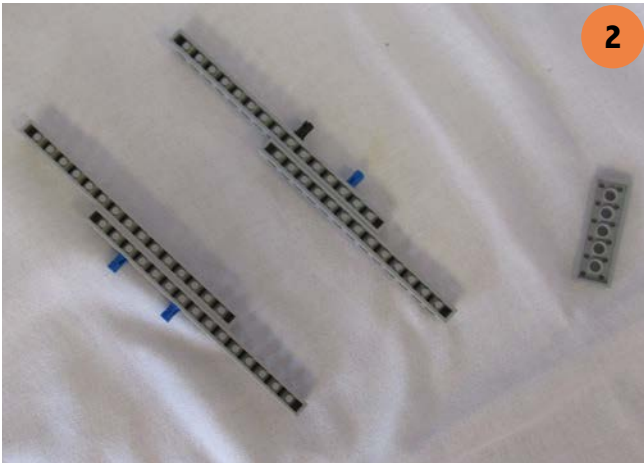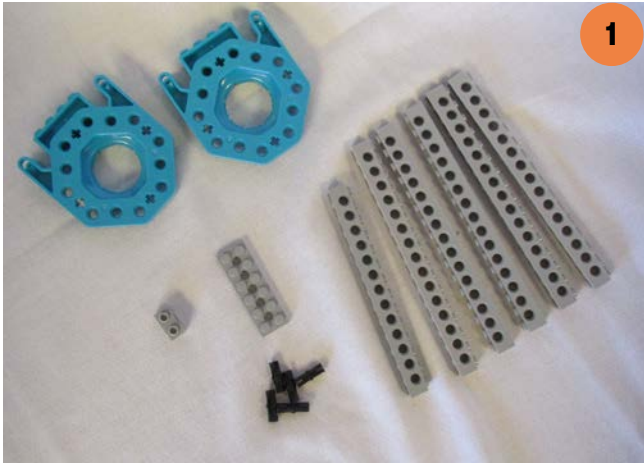
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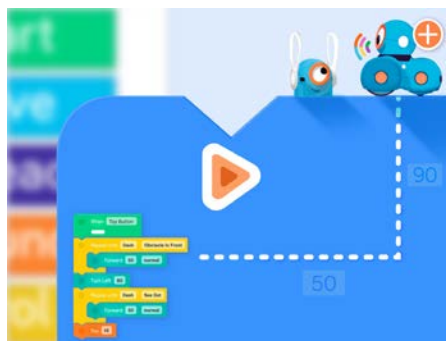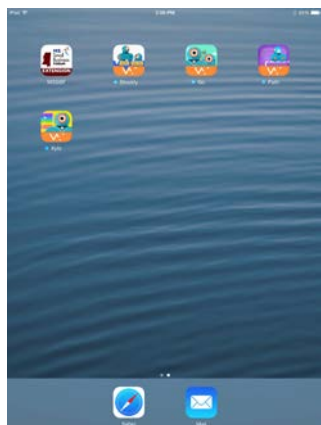
2. Connect Dash

Don't forget to make sure Dash is connected – use the plus sign in the upper right hand corner

3. Tap the Go Button

4. Program Dash to Hear the Drivers
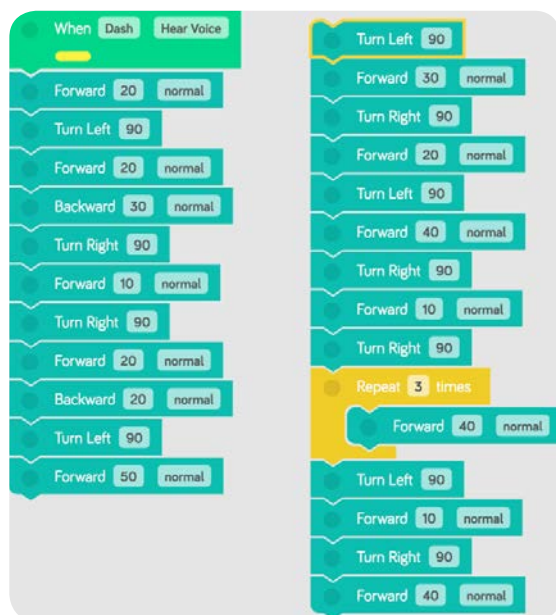
Share

▶ Once everyone is done, have youth take their robots to the town area. Ask groups to demonstrate their robots and discuss how they programmed Dash.

Process

▶ Was it easy to use the sensor? Why or why not?

▶ Could you add flashing lights when Dash finds a car or a siren to let other people know about the stranded driver?

Generalize

▶ What kind of sensor would you make for a robot? What would it do?

▶ Draw the sensor and the robot.

Apply

▶ Could you add flashing lights when Dash finds a car or a siren to let other people know about the stranded driver?

▶ Go back and see what other features you could add to help in Dash's rescue efforts.

Recharge/Clean-up Time: (15 minutes)

▶ Ask one youth from each group to plug Dash in so that he can recharge his batteries.

▶ Ask one youth from each group to plug in their tablet.

▶ Have all of the youth clean up their work area.

DAY 3

Welcome (10 minutes)

Welcome to our 4-H Robotics Club meeting! Who would like to lead us in saying the 4-H pledge?

I pledge
My Head to clearer thinking,
My Heart to greater loyalty,
My Hands to larger service, and
My Health to better living,
For My Club, My Community,
My Country, and My World.

If necessary, remind youth of the camp rules. Ask for volunteers to share what their favorite activity was from the previous day or what they learned.

Unit 5/Building Block 2: (45 minutes)   Dash Takes the Driver's Temperature

Re-read slide 16 of the Snow-tastrophe story if necessary to remind youth that some of the drivers were getting sick and needed Dash's help.

Experience
- Direct the 4-H Cloverbuds' attention to the three cups of water on their tables.
- Each cup has water in it, but the water is a different temperature in each one. On the table is a thermometer. Have any of you used a thermometer before? Why?
- Use your thermometer to take the temperature of the cup of cold water. Demonstrate for the youth how the thermometer works. Tell the youth that the numbers on the screen are the reading.
- This cup has a temperature reading of _____. Now turn on your thermometer and put its tip into the cold water cup. What is the temperature reading of your cold water?
- Turn the thermometer off and back on. Now take the reading of the room temperature water. What is its reading?
- Turn the thermometer off and back on. Now take the reading of the hot water. What is its reading?
- Now that we know how to take a temperature reading, we must figure out how Dash can take the temperature of the drivers! But since we don't have any very tiny people in our very tiny cars, we will practice with Dash taking our temperature.
- How should we attach the thermometer to Dash?
- Let's watch this video of a robot doctor: http://cw33.com/2015/01/26/dr-zippy-childrens-health-gets-robot-doctor/
- How could we make Dash a friendly robot doctor? One way is by having Dash talk to the sick people so they aren't scared. Let's see how we can help Dash communicate with the patients using the Sound block.
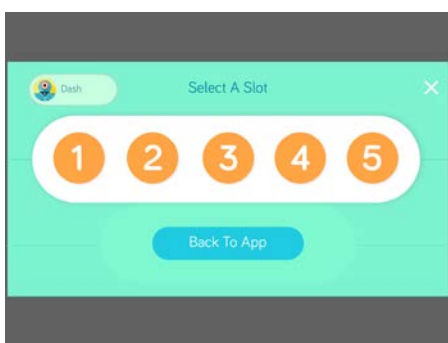
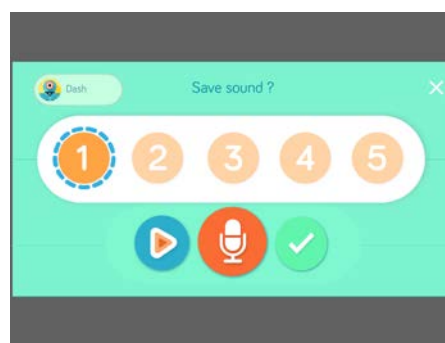## *Recording Sound Using the My Sounds Block*
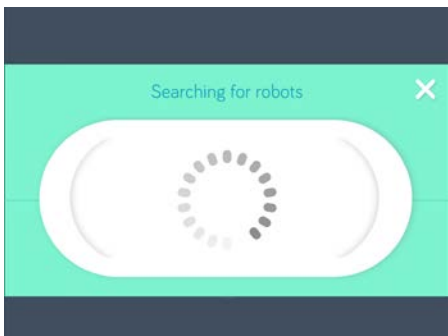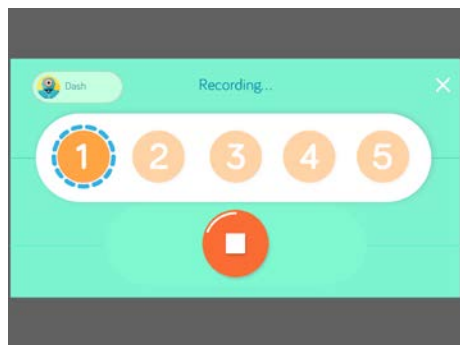

1. Be sure Dash is connected to the tablet.
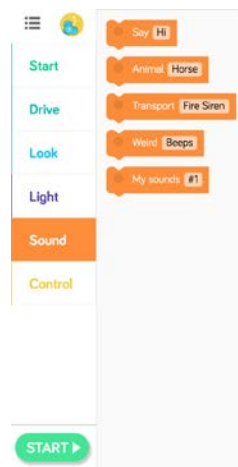
2. Show Clover-buds where the My Sounds Block is and have them drag it to the screen. Tap #1.
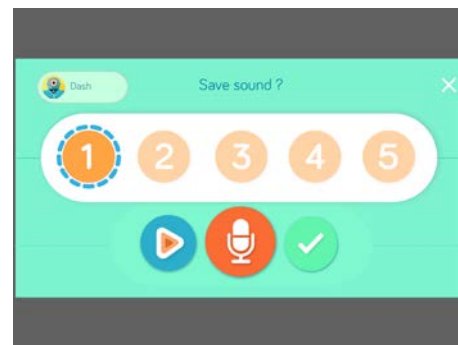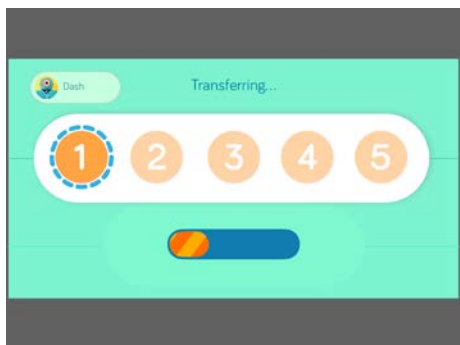

3. Select a sound slot for the new sound.
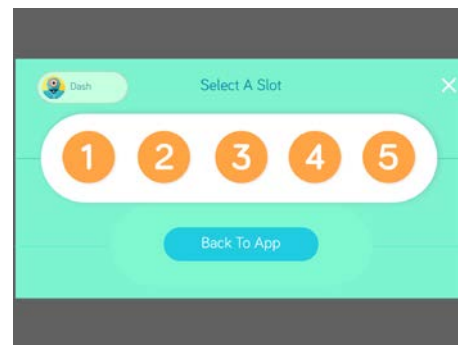

4. Tap the microphone button.

5. Record your phrase. Tap stop when finished.

6. Tap the green check mark to save the sound.

7. Wait while the sound transfers.

8. Tap the Back to App button.

▶ Now, how could we put the sound block together with Dash's thermometer to take our temperature? Refer to the Dash Takes Temperature programming guide for ideas.

Share
▶ Allow enough time for Dash to record the temperature of the youth.
▶ How many of you had a temperature of 98.6 degrees? The normal temperature for humans is 98.6 degrees.

Process
▶ Did you have any problems with Dash taking your temperature?
▶ Did he do what you wanted him to do?
▶ What could you do differently next time?
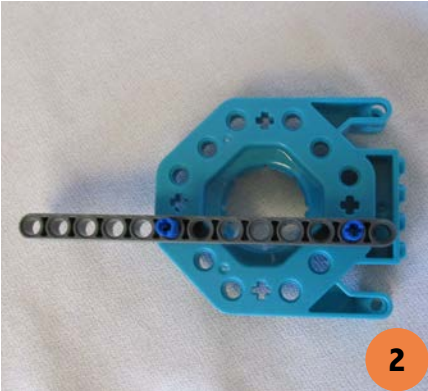
Generalize
▶ Would you like to go to a robot doctor? Why or Why not?

Apply
▶ What else could you program a robot doctor to do?
▶ If time permits, watch this video clip from Big Hero 6: https://www.youtube.com/watch?v=5xttZ4JOn-Sk.
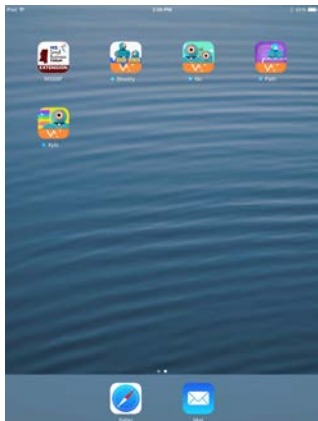
Optional Activity (or use in conjunction with snack)
▶ In the movie, Hiro called Baymax a walking marshmallow. Let's see if we can make Baymax.

▶ Let the youth eat one marshmallow. Tell youth to put a second jumbo marshmallow on a paper plate. Place the marshmallow in a microwave for 60 seconds and let the youth observe what happens. The once soft marshmallow is now dry and crunchy! How did that happen?

▶ When the marshmallow is heated up, water inside the marshmallow heats up and makes warm air bubbles inside of the marshmallow. As the air bubbles expand, the marshmallow gets bigger and bigger until the air bubbles pop and deflate.
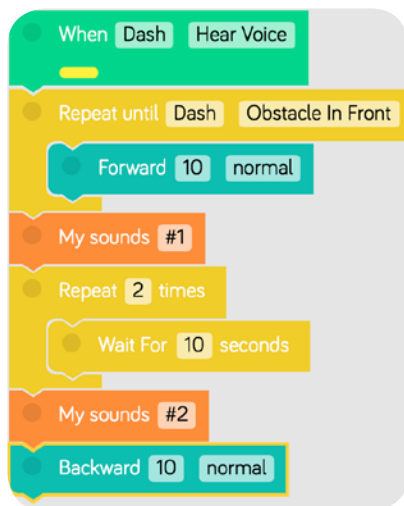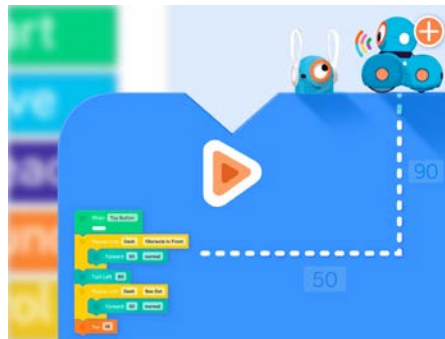
Dash Takes Temperature Programming Guide

1. Tap the Blocky App to Open

2. Connect Dash

Don't forget to make sure Dash is connected – use the plus sign in the upper right hand corner
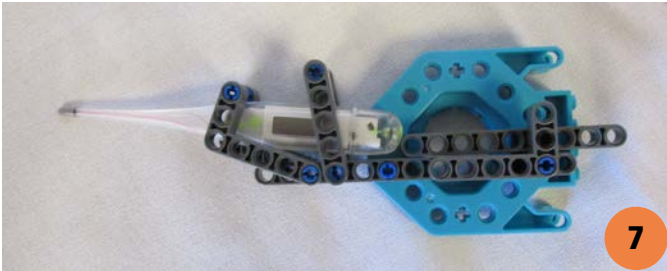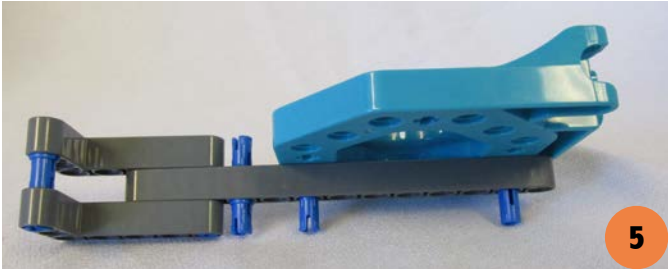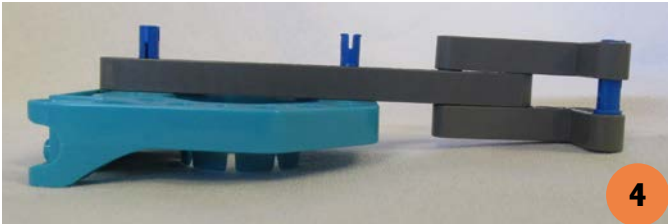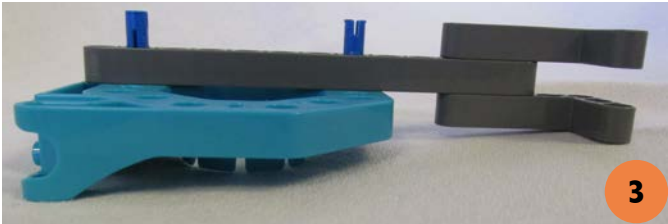
3. Tap the Go Button

4. Program Dash to Take Your Temperature

TO RECORD A SOUND:

Tap My Sound

Tap #1

Tap Record a New Sound

The tablet will search for Dash; be sure Dash is connected.

Select a slot.

Press the Microphone button to begin recording.

Tap OK when Blockly asks to access the microphone.

It will count down 3-2-1.

Record, "Can I take your temperature? Open wide and be sure the thermometer is under your tongue for a good reading."

Save the sound by tapping the green check mark.

The sound will now transfer to the app. Remember, the sounds are not saved.

Record Sound 2 using the same steps, but have Dash say, "Open wide. Thank you for letting me take your temperature!"

UNIT 6: GETTING BACK TO NORMAL

Goals:
▶ To understand how a simple circuit works
▶ To communicate what they have done

Objectives:
4-H Cloverbuds will be able to
▶ Create an electric circuit
▶ Explain how a circuit works

Prepare:
▶ Set up the electrical lines and train for the town.
▶ Print photographs of youth for their memory books.**
▶ For each group, place one battery, one strip of aluminum foil, and one light bulb into a plastic bag.
▶ Blow up at least 50 balloons.

Materials:
❏ 1 D battery for each group
❏ 1 strip of aluminum foil (1 inch wide by 6 inches long) for each group
❏ 1 (1.5v) light bulb for each group
❏ 1 plastic sandwich bag for each group
❏ 1 small photo book for each participant**
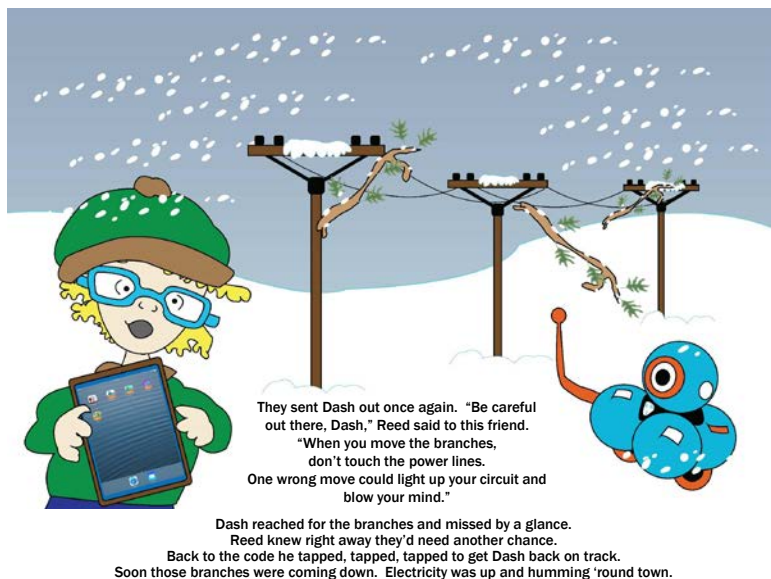
**Optional.

Unit 6/Building Block 1: (45 minutes)   Dash Removes Tree Limbs

Read slides 16-20 of the story Snow-tastrophe.

Discuss
▶ Explain to 4-H Cloverbuds that electricity can be dangerous.
▶ If possible, take youth outside to observe a power line.
▶ Sometimes when storms occur, wind can blow tree limbs onto the power lines or the poles that support the power lines can fall down. This can be very dangerous to humans! We never want to touch any power line that is down. In fact, we want to stay far away and call for help.
▶ When a situation is dangerous, sometimes a robot like Dash can help. Why do you think it would be better to send a robot to repair the lines instead of a human?

They sent Dash out once again. "Be careful out there, Dash," Reed said to this friend. "When you move the branches, don't touch the power lines. One wrong move could light up your circuit and blow your mind."

Dash reached for the branches and missed by a glance.
Reed knew right away they'd need another chance.
Back to the code he tapped, tapped, tapped to get Dash back on track.
Soon those branches were coming down. Electricity was up and humming 'round town.

Experience

▶ Take youth to the town area and show them the electric poles.

▶ Your challenge is to help Dash remove the limbs. What can we do?

▶ Allow youth to brainstorm their options. Use the building and programming guide if needed.

Share

▶ After youth have had a chance to work with their robot design, take them back to the town.

▶ Give youth a chance to show what their robot can do. Allow time for tweaks and re-tries.

Process

▶ What was hard about programming Dash to remove the tree limbs?

▶ Did you run into the poles?

▶ What type of attachment was best for Dash to remove the tree limbs?

Generalize

▶ Give each group a battery, aluminum foil, and a light bulb.

▶ Robots need energy to go about their tasks. Where does that energy come from? Batteries! Look at your batteries. Do you see the side with the bump? That is the positive side. The flat end of the battery is the negative end. Electrons flow from the negative end of the battery to the positive end. Do you see any electrons? I don't either! We need a conductor to conduct the electrons as they travel from the negative end to the positive end.

▶ Using the materials in front of you, see if you can make the light bulb light up.

The local reporter went live on TV
and told the town there was nothing to see.
Dash the robot and his friends
had brought this snowy mess to an end.

Back inside the laboratory, Camila Mae and Reed couldn't believe their crazy story.
They looked at each other and flopped in a chair.
When would their parents discover this snowy affair?
Vinnie the Cat was still taking a nap, as if he had nothing to do with this mishap.

All of a sudden, the telephone rang. Up from the chair Camila Mae sprang.
"This is the Governor!" the caller boomed. *"I'm calling to say you and your friends have saved the day!*
You all programmed brilliantly! From the disaster you did not run away.
In honor of you, I hereby proclaim Mississippi's Youth Programming Day!

- ◢ Allow youth to experiment for a few minutes. Then explain that youth should:

  - Fold the aluminum foil like a narrow fan (less than ¼ inch wide)

  - Wrap one end of the foil around the base of the lightbulb

  - Place the negative end of the battery on the opposite end of the aluminum foil

  - Touch the lightbulb to the positive end of the battery

- ◢ The aluminum foil conducts the electrons from the negative end, through the lightbulb, all the way to the positive end. It makes a BIG loop. This loop is called a circuit. When the circuit is CLOSED, the bulb lights up.


"Wow," said the friends, who were listening in,
"Let's find a new programming adventure to begin!"
Camila Mae and Reed looked at each other and laughed out loud.
Camila Mae said, "Oh, no, no, no! We must recharge before we tackle more snow."

- ◢ Now take the aluminum foil off of the bottom of the battery. What happened? That is because the circuit is broken.

- ◢ Challenge youth to find other ways to connect the light bulb to the battery. Does the light bulb work if it is connected to the negative end? What if it is sideways? What other options for connection can the youth come up with?
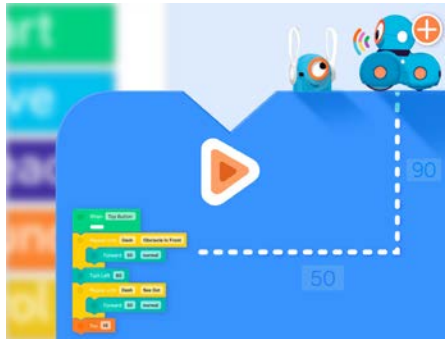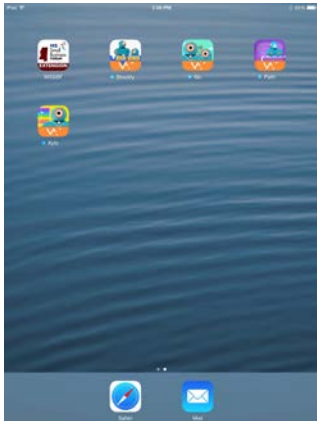
Apply

- ◢ If time permits, read Randy Riley's Really Big Hit by Chris Van Dusen.

- ◢ Ask youth what type of robot they would create to save the day or have them draw it.

Dash Removes Limbs Building Guide

1

2

3

4

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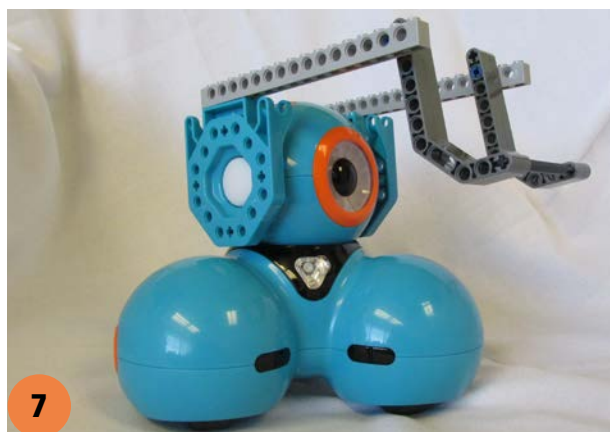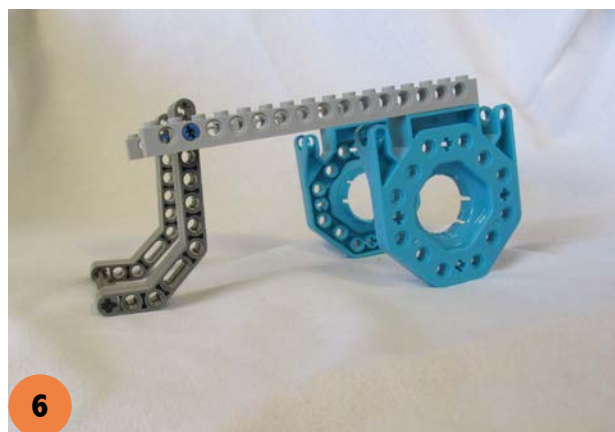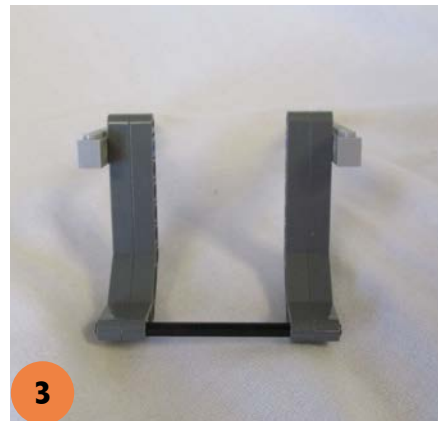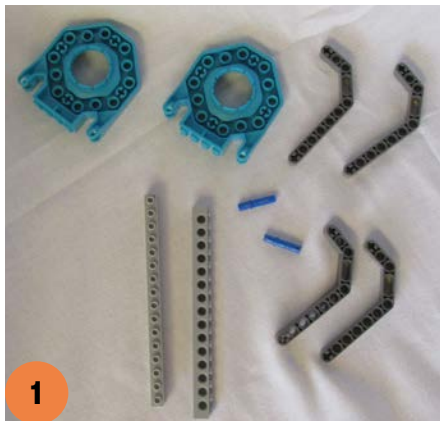
Dash Removes Limbs Programming Guide
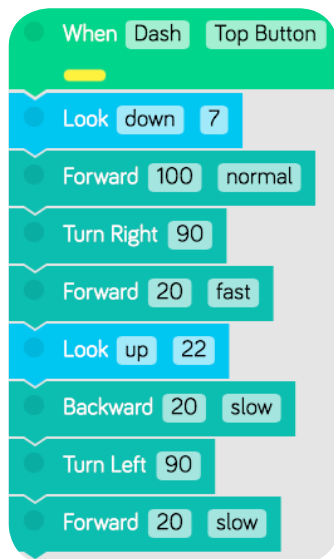
1. Tap the Blocky App to Open

2. Connect Dash

Don't forget to make sure Dash is connected – use the plus sign in the upper right hand corner

3. Tap the Go Button

4. Program Dash to Remove Limbs

REMEMBER TO KEEP YOU AND DASH SAFE WITH ELECTRICITY!

Electrical lines carry a great deal of electricity in them so they can power your home. What are some things in your home that require electricity? Circle the things that use electricity.

Sometimes, like in our story, the electrical lines can be damaged. When you see a damaged power line, you should:

❏ Stay away from it
❏ Tell an adult
❏ If you are in your car, stay inside the car

Who could you tell about electricity safety in your home?

_____

Snack: 15 minutes
- ❏ Raisins
- ❏ Marshmallows (optional)
- ❏ PB crackers
- ❏ Water or Juice

Teamwork Activity: 15 minutes

Materials
- ❏ At least 50 balloons
- ❏ 1 roll masking tape for each group

▶ *Divide Cloverbuds into groups of three to four youth. Give each group a roll of masking tape.*
▶ You have 15 minutes to build the tallest "snowball" balloon tower you can using only the balloons and masking tape. The snowball tower cannot touch the wall or lay on the floor.

Unit 6/Building Block 2: (45 minutes)   Dash Turns on the Train

Discuss
▶ What do you know about trains? Have you ever seen a train? What do trains do? What might they carry?
▶ Remind youth that the trains had quit working as the snow got higher and higher. Dash had to turn the switch back on so supplies could be delivered.

Experience
▶ Take youth to the model town. Show them the train and the switch to turn on the train.
▶ What type of supplies might a train carry?
▶ Allow youth to brainstorm their options for turning on the switch. Use the building and programming guide if needed.

Share
▶ After youth have had a chance to work with their robot design, take them back to the town.
▶ Give youth a chance to show what their robot can do. Allow time for tweaks and re-tries.

Process
▶ What was more difficult: building the arm or turning on the switch? Why?
▶ Was it hard for Dash to turn on the switch?
▶ How did you help Dash have enough force to get the switch on?

Generalize
▶ What would happen if the train could not deliver supplies to the town?
▶ How could they use robots to make the train and the train tracks work better?

Apply
▶ If you could create an entirely robotic train station, what would it look like?
▶ Allow youth to use LEGO building blocks to modify the train station. Youth might want to create an attachment or program for Dash to help with the following:
  - Taking tickets from passengers
  - Loading supplies
  - Helping derailed trains get back on the track
  - Clearing the track
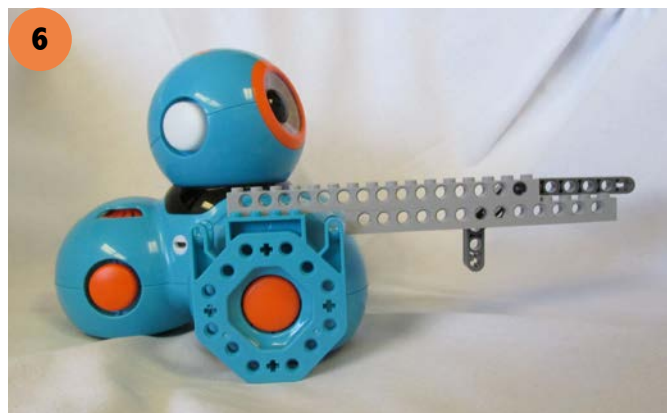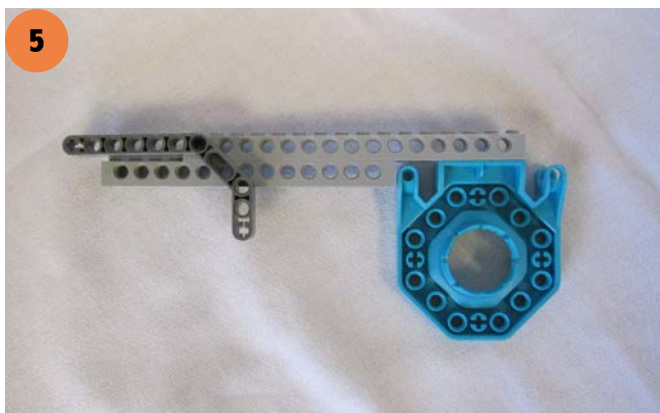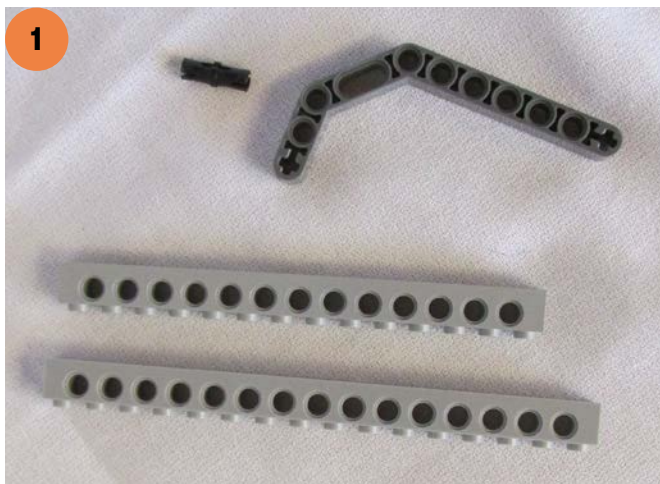
Dash Turns on the Train Programming Guide
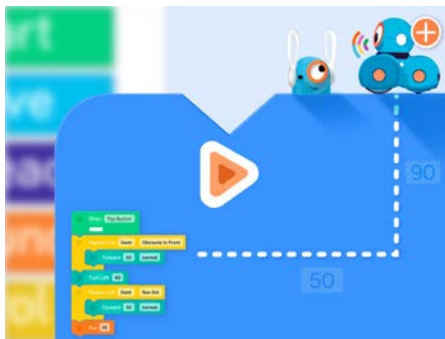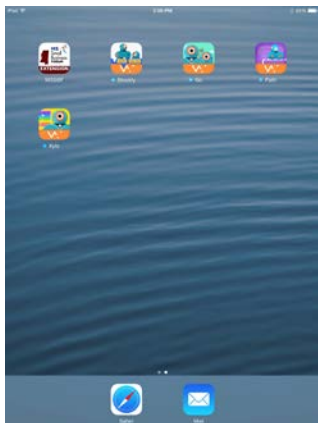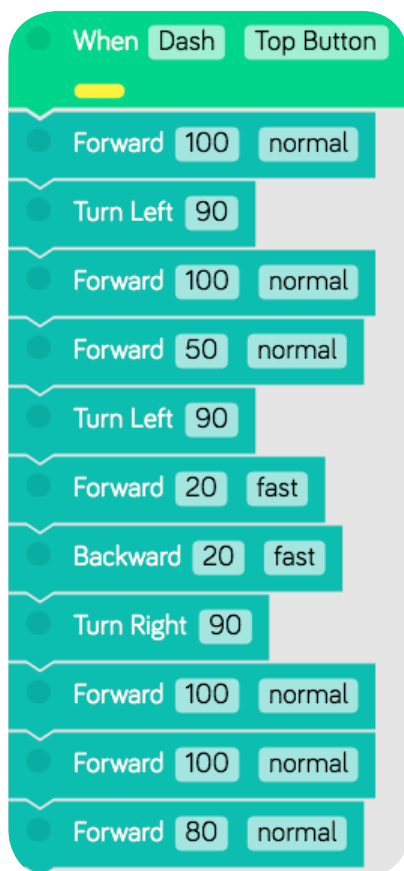
1. Tap the Blocky App to Open

2. Connect Dash

Don't forget to make sure Dash is connected – use the plus sign in the upper right hand corner

3. Tap the Go Button

4. Program Dash to Turn on the Train

When Dash Top Button

Forward 100 normal

Turn Left 90

Forward 100 normal

Forward 50 normal

Turn Left 90

Forward 20 fast

Backward 20 fast

Turn Right 90

Forward 100 normal

Forward 100 normal

Forward 80 normal

Youth Prepare for Parent Showcase: (35 minutes)

▶ It is almost time for your parents and guardians to come. Before they come, you need to prepare to showcase what you have learned.

▶ Option 1: Ask youth to tell you what they learned at camp that they would like to share with their parents.

▶ Option 2: Write the different activities down on index cards. Allow youth to draw from the stack of cards what they will showcase.

▶ Place youth into pairs according to their interests. Tell the 4-H Cloverbuds they have 20 minutes to prepare their showcase and presentations.

▶ If time permits, give each group a chance to practice its showcase. Encourage Cloverbuds to stand up tall and speak so that they can be heard.

▶ Remember to start your presentation with these words: "My name is _____ and today I am going to tell you about _____." When your parents come in, you will be the teachers and teach your parents how to program!

▶ Consider asking a youth volunteer to do the welcome and pledge.

Parent Showcase and Reception/Pizza Luncheon: (90 minutes)

▶ As parents arrive, ask them to sit with their 4-H Cloverbud at his/her table.

▶ Once all the parents arrive, greet the parents as a group and ask for a youth volunteer to lead the 4-H Pledge.

▶ Have each group present their showcase presentation.

▶ After everyone has finished, present certificates.

▶ You can also let youth and parents create a memory book of the camp together so youth can tell their parents about their experiences. During the week, take pictures of the youth as they work. Have the photos developed at a one-hour processing location. Buy or make small do-it-yourself photo books (http://www.orientaltrading.com/draw-and-write-journals-a2-12_4665-11-0.fltr?xsale-Sku=13666628) and give participants a chance to put their books together during lunch. Provide stickers, markers, etc. to decorate with.

▶ Dismiss everyone to enjoy the pizza luncheon.

Supplemental Programming Ideas

If you would like to extend the story, try the following scenarios:

SUPPLEMENTAL BUILDING BLOCK #1

▸ In our story, the Governor calls to congratulate Camila Mae and Reed. They decide to send Dash to Jackson to pick up the proclamation from the Governor. Dash must travel from Starkville, MS, to Jackson, MS. Jackson is the capital of Mississippi.

▸ Provide youth with a map of the state of Mississippi. Ask them to find Starkville on the map. Then ask them to find Jackson.

▸ Which highway would be best for Dash to travel on? How many miles is it?

▸ If they take highway 25, it is 125 miles from Starkville to Jackson. However, for the pre-determined measurements in Blockly we used 130 cm/miles to Jackson.

▸ If they take highway 12 and highway 55, it is also 125 miles from Starkville to Jackson. However, for the pre-determined measurements in Blockly we used 60 cm/miles to Winona and 90 cm/miles to Jackson.

1 mile = 1 centimeter

▸ Use electrical tape to create a road for Dash to travel on. Discuss with the Cloverbuds the concepts of north and south. Show them on the map that Starkville is north of Jackson. The programming guide below assumes that Dash is facing north and has to turn left to get on the road headed south.

Dash Heads South Programming Guide
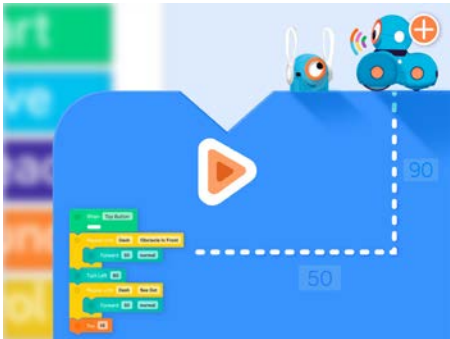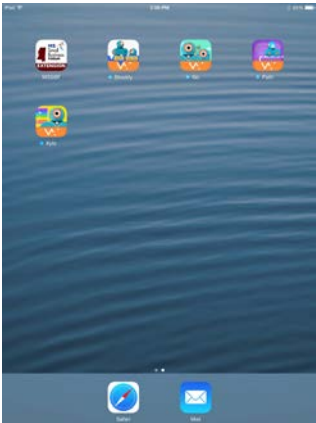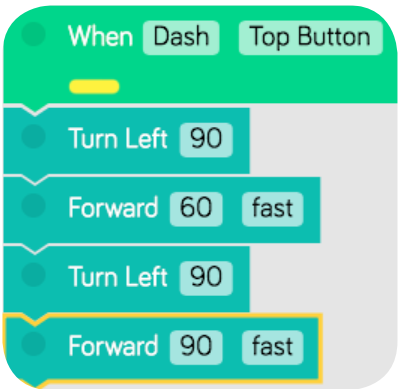
1. Tap the Blocky App to Open
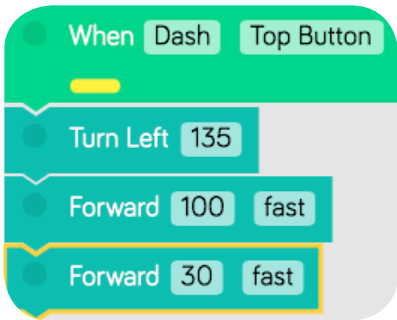

2. Connect Dash

Don't forget to make sure Dash is connected – use the plus sign in the upper right hand corner

3. Tap the Go Button

4. Program Dash to Head South on Hwy 12 and Hwy 55

When Dash Top Button

Turn Left 90
Forward 60 fast
Turn Left 90
Forward 90 fast

5. Program Dash to Head South on Hwy 25

When Dash Top Button

Turn Left 135
Forward 100 fast
Forward 30 fast

What would you have to do to help Dash drive back home? _____

_____

What direction would Dash have to go?   North   South   East   West

Could Dash make it home faster if he went really fast? Do you think he would get a speeding ticket? _____

_____

SUPPLEMENTAL BUILDING BLOCK #2

▶ Jackson is the capital of Mississippi and a very busy place! There are many people looking for a place to park around the State Capitol and very few parking spaces. Dash must park on the street in a parallel parking spot. Parallel parking is hard to do. Dash's friend Dot must get out and help Dash park.

▶ If possible, take the Cloverbuds outside to see what parallel parking looks like. Have them practice parallel parking toy cars or even bicycles if they are available.

▶ In order for Dash to be successful parallel parking, he will need a 'wall' in front. A piece of foam board or cardboard will work as a wall for Dash to detect.

Dash Parallel Parks at the Capitol

1. Tap the Blocky App to Open
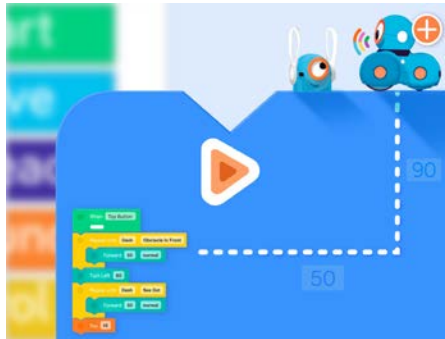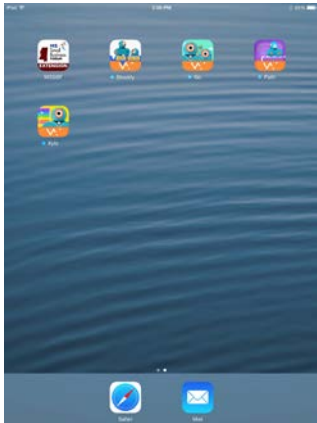
2. Connect Dash

Don't forget to make sure Dash is connected – use the plus sign in the upper right hand corner

3. Tap the Go Button

4. Program Dash to Parallel Park

Have you ever seen a car parallel park itself?   YES   NO

How does the car know how to parallel park?
   a. Sound sensor
   b. Touch sensor
   c. Light sensor
   d. Sonar sensor

Can you draw what a sonar sensor would look like on a car?

Glossary

App – an app, or application, is a program or piece of software created to do a certain thing; example: the games on a phone or tablet

Brainstorm – to come up with ideas for how to do something

Code – source code or computer code is any collection of instructions that tells a computer what to do. It is often written using some human-readable computer language, usually as words.

Dry Ice – the solid form of carbon dioxide, which is the gas we breathe out. Carbon dioxide goes directly from a solid to a gas without going through a liquid phase. Dry ice is usually used as a refrigerant.

Educated Guess – a guess based on what you know from school and home

Engineer - a person who designs, builds, or maintains engines, machines, or public works, such as robots and roads.

Hypothesis – an educated guess

LED – LED stands for light-emitting diode: a semiconductor diode or a small light bulb that emits light when electricity is moving through it

Molecule – a molecule is a group of two or more atoms (or tiny things that make up everything) that stick together. Molecules are so small that nobody can see them, except with a super strong microscope.

Polymer – polymers are made of lots of molecules that are connected together to make something you can touch

Program – a series of coded software (computer language) instructions to control how a computer or other machine runs

Programmer – a person who designs computer programs

Obstacles – something that keeps something else from moving forward

SOS – the letters represented by the radio telegraphic signal ($\cdots - - - \cdots$) used as an internationally recognized call for help, especially by ships in trouble
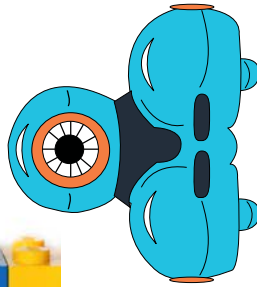
This certificate hereby recognizes that

_____
(Name)

achieved a high level of coding awesomeness!

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(Date)

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(Location)

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Exetension Agent

_____
Volunteer Leader

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By **Dr. Mariah Morgan,** Assistant Extension Professor, Extension Center for Technology Outreach.

M2053 (06-15)